



DOCUMENTATION

FEMP HVAC UPGRADE PROJECTS FORT RILEY, KANSAS

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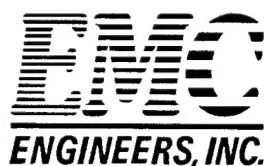
U.S. ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT
KANSAS CITY, MISSOURI

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Marie Wakefield,
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FEMP Project No. 1

Upgrade HVAC Systems in Dental Clinics
Buildings 602, 7665, and 7670

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95	
3. INSTALLATION AND LOCATION Fort Riley, Kansas			4. PROJECT TITLE Upgrade HVAC Systems in Dental Clinics		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
Upgrade HVAC Systems in Dental Clinics	LS			79	
TOTAL CONTRACT COST				79	
SIOH (5.5%)				4	
DESIGN COST (6.0%)				5	
TOTAL PROJECT COST				88	
Total Request (Rounded)				90	
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the dental clinics, Buildings 602, 7665, and 7670. The HVAC system upgrades include the following: <ul style="list-style-type: none"> Convert the existing dual duct air handling unit (AHU) serving Building 602 to a variable-air-volume (VAV) AHU. A variable speed drive (VSD) will be installed to control the supply fan speed. The existing dual duct mixing boxes will be replaced with dual duct VAV terminal units. The existing ductwork will remain. Convert the existing multizone AHU serving Building 7665 to a VAV AHU. A VSD will be installed to control the supply and return fan speed. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Convert the existing dual duct AHU serving Building 7670 to a VAV AHU. A VSD will be installed to control the supply and return fan speed. The existing dual duct mixing boxes will be replaced with dual duct VAV terminal units. The existing ductwork will remain. 					
11. REQUIREMENT: <u>Project:</u> This Federal Energy Management Program (FEMP) project will convert the existing dual duct and multizone AHUs to VAV AHUs in the dental clinics, Buildings 602, 7665, and 7670. <u>Requirement:</u> This project is required to reduce the natural gas and electrical consumption of the existing dual duct and multizone AHUs by reducing their air flow rates through VAV technology. An immediate utility savings would be recognized. <u>Current Situation:</u> The dental clinic buildings are single story buildings with the following floor areas and HVAC system types: <ul style="list-style-type: none"> Building 602 is a 11,560 sq ft building and is heated and cooled by a dual duct AHU. Building 7665 is a 11,080 sq ft building and is heated and cooled by a multizone AHU. Building 7670 is a 14,960 sq ft building and is heated and cooled by a dual duct AHU. 					

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		
4. PROJECT TITLE Upgrade HVAC Systems in Dental Clinics		5. PROJECT NUMBER
<p>11. REQUIREMENT (continued):</p> <p>Impact if Not Provided: If this project is not funded, a reduction of 1,459 MBtu/yr (1,537,778 MJ/yr) cannot be achieved. The Army will not realize a \$23,779 annual energy dollar savings with a 3.7 year simple payback and a savings-to-investment ratio (SIR) of 4.22. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.</p> <p>Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.</p> <p>Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.</p> <p>Amount of Energy Conserved: The amount of energy conserved is estimated to be 1,459 MBtu per year (1,537,778 MJ/yr).</p>		

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION: Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE: Upgrade HVAC Systems in Dental Clinics		FISCAL YEAR: 1995
ANALYSIS DATE: 05/23/95	ECONOMIC LIFE: 20	PREPARED BY: A. Niemeyer

1. INVESTMENT: **Dental Clinic Buildings 602, 7665, and 7670 - Convert DD AHUs and MZ AHU to VAV AHUs**

A. CONSTRUCTION COST	=	\$78,841
B. SIOH COST	(5.5% of 1A) =	\$4,336
C. DESIGN COST	(6.0% of 1A) =	\$4,730
D. TOTAL COST	(1A + 1B + 1C) =	\$87,908
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$87,908

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	1,871	\$22,639	15.88	\$359,509
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(412)	(\$1,697)	18.30	(\$31,063)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$2,837	14.88	\$42,215
F. TOTAL		1,459	\$23,779		-----> \$370,660

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1	ANNUAL MAINTENANCE	\$0	14.88	\$0
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bf1/Economic Life))	\$23,779
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	3.70
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$370,660
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	4.22

(MUST HAVE SIR > 1.25 TO QUALIFY)

FEMP Project No. 1

Upgrade HVAC Systems in Dental Clinics
Buildings 602, 7665, and 7670

Backup Data

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 602 - Convert DD AHUs to DDs with VAV Units

A. CONSTRUCTION COST	=		\$31,697
B. SIOH COST	(5.5% of 1A) =		\$1,743
C. DESIGN COST	(6.0% of 1A) =		\$1,902
D. TOTAL COST	(1A + 1B + 1C) =		\$35,342
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=		\$0
F. PUBLIC UTILITY COMPANY REBATE	=		\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =		-----> \$35,342

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	681	\$8,237	15.88	\$130,809
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(132)	(\$546)	18.30	(\$9,984)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$1,242	14.88	\$18,480
F. TOTAL		548	\$8,934		-----> \$139,305

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
(TABLE A-2)				
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$8,934

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 3.96

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$139,305

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 3.94

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 602								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4	VSD25	VARIABLE SPEED DRIVE W/ CONTRLER, 25HP	EA.	1	\$5,426.40	\$5,426	1-ELEC	25	\$523	\$5,950
5	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	44	\$24.23	\$1,066	1-ELEC	0.8	\$737	\$1,803
6	WIRE#12	COPPER WIRING #12	C.L.F.	9	\$7.41	\$67	1-ELEC	0.727	\$137	\$204
7	VAVBX5	VAV BOX, 500 CFM, ELEC	EA.	37	\$327.00	\$12,099	1-SHEE	1.48	\$1,140	\$13,239
8	VAVBX8	VAV BOX, 800 CFM, ELEC	EA.	5	\$331.40	\$1,657	1-SHEE	1.5	\$156	\$1,813
9	VAVBX12	VAV BOX, 1200 CFM, ELEC	EA.	1	\$334.30	\$334	1-SHEE	1.7	\$35	\$370
10	VAVBX20	VAV BOX, 2000 CFM, ELEC	EA.	1	\$345.90	\$346	1-SHEE	1.83	\$38	\$384
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21										
22										
23										
24										
25		EXISTING SYSTEMS DEMOLITION								
26		DUAL DUCT MIXING BOX DEMO	EA.	44.0			1-SHEE	3	\$2,747	\$2,747
27										
28										
29										
30										
31		SUBTOTAL				\$15,569				\$20,559
32	OH	OVERHEAD			17%	\$2,616			\$4,990	\$3,454
33	PRO	PROFIT			10%	\$1,818			\$583	\$2,401
34	CONT	CONTINGENCY			20%	\$4,001			\$1,282	\$5,283
35	TOTAL COST					\$24,003			\$7,694	\$31,697

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7665 - Convert Existing MZ to VAV AHUs

A. CONSTRUCTION COST	=	\$10,951
B. SIOH COST	(5.5% of 1A) =	\$602
C. DESIGN COST	(6.0% of 1A) =	\$657
D. TOTAL COST	(1A + 1B + 1C) =	\$12,210
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$12,210

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	JAN '95 DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	301	\$3,637	15.88	\$57,752
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(107)	(\$440)	18.30	(\$8,046)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$637	14.88	\$9,479
F. TOTAL		194	\$3,834		-----> \$59,185

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3) (TABLE A-2)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bd4) = \$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bd1/Economic Life))	\$3,834
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	3.18
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$59,185
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	4.85
(MUST HAVE SIR > 1.25 TO QUALIFY)		

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7665								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4										
5	VSD15	VARIABLE SPEED DRIVE W/ CONTRLER, 15HP	EA.	1.0	\$4,060.11	\$4,060	1-ELEC	19	\$398	\$4,458
6	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	6.0	\$24.23	\$145	1-ELEC	0.8	\$100	\$246
7	WIRE#12	COPPER WIRING #12	C.L.F.	7.0	\$7.41	\$52	1-ELEC	0.727	\$107	\$158
8	VAVBX12	VAV BOX, 1200 CFM, ELEC	EA.	2.0	\$271.32	\$543	1-SHEE	1.13	\$47	\$590
9	VAVBX24	VAV BOX, 2400 CFM, ELEC	EA.	2.0	\$287.31	\$575	1-SHEE	1.33	\$55	\$630
10	VAVBX70	VAV BOX, 7000 CFM, ELEC	EA.	2.0	\$353.69	\$707	1-SHEE	2.6	\$108	\$816
11	ELE-SWIT	DDC SWITCH	EA.	1.0	\$69.77	\$70	1-STPI	0.5	\$11	\$81
12										
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22										
23										
24										
25										
26		EXISTING SYSTEMS DEMOLITION	EA.	6.0			1-SHEE	1	\$125	\$125
27		ZONE DUCTWORK DEMOLITION								
28										
29										
30										
31		SUBTOTAL				\$6,152				\$7,103
32	OH	OVERHEAD			17%	\$1,033			\$951	\$1,193
33	PRO	PROFIT			10%	\$719			\$111	\$830
34	CONT	CONTINGENCY			20%	\$1,581			\$244	\$1,825
35	TOTAL COST			-	-	\$9,485	-	-	\$1,466	\$10,951

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7670 - Convert DD AHUs to DDs with VAV Units

A. CONSTRUCTION COST	=	\$36,193
B. SIOH COST	(5.5% of 1A) =	\$1,991
C. DESIGN COST	(6.0% of 1A) =	\$2,172
D. TOTAL COST	(1A + 1B + 1C) =	\$40,355
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$40,355

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	889	\$10,760	15.88	\$170,875
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(173)	(\$713)	18.30	(\$13,042)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$958	14.88	\$14,255
F. TOTAL		716	\$11,006		-----> \$172,088

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$11,006

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 3.67

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$172,088

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 4.26

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7670								
2		PROPOSED SYSTEM MODIFICATIONS								
3	VSD15	VARIABLE SPEED DRIVE W/ CONTRLER, 15HP	EA.	1	\$4,060.11	\$4,060	1-ELEC	38	\$795	\$4,855
4	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	50	\$24.23	\$1,211	1-ELEC	0.8	\$837	\$2,048
5	WIRE#12	COPPER WIRING #12	C.L.F.	10	\$7.41	\$74	1-ELEC	0.727	\$152	\$226
6	VAVBX5	VAV BOX, 500 CFM, ELEC	EA.	36	\$327.00	\$11,772	1-SHEE	1.48	\$1,109	\$12,881
7	VAVBX8	VAV BOX, 800 CFM, ELEC	EA.	7	\$331.40	\$2,320	1-SHEE	1.5	\$219	\$2,538
8	VAVBX12	VAV BOX, 1200 CFM, ELEC	EA.	2	\$334.30	\$669	1-SHEE	1.7	\$71	\$739
9	VAVBX20	VAV BOX, 2000 CFM, ELEC	EA.	5	\$345.90	\$1,730	1-SHEE	1.83	\$190	\$1,920
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17										
18										
19										
20										
21										
22										
23										
24										
25		EXISTING SYSTEMS DEMOLITION								
26		DUAL DUCT MIXING BOX DEMO	EA.	50.0			1-SHEE	3	\$3,122	\$3,122
27										
28										
29										
30										
31		SUBTOTAL				\$17,775			\$5,700	\$23,475
32	OH	OVERHEAD			17%	\$2,986			\$958	\$3,944
33	PRO	PROFIT			10%	\$2,076			\$666	\$2,742
34	CONT	CONTINGENCY			20%	\$4,568			\$1,465	\$6,032
35	TOTAL COST					\$27,405			\$8,788	\$36,193

FEMP Project No. 2

Upgrade HVAC Systems in Dining Facilities
Buildings 7245, 7606, and 7654

1. COMPONENT ARMY		FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95	
3. INSTALLATION AND LOCATION Fort Riley, Kansas				4. PROJECT TITLE Upgrade HVAC Systems in Dining Facilities		
5. PROGRAM ELEMENT		6. CATEGORY CODE		7. PROJECT NUMBER		8. PROJECT COST (\$000)
9. COST ESTIMATES						
ITEM				U/M	QUANTITY	COST (\$000)
Upgrade HVAC Systems in Dining Facilities				LS		558
TOTAL CONTRACT COST						558
SIOH (5.5%)						31
DESIGN COST (6.0%)						33
TOTAL PROJECT COST						622
Total Request (Rounded)						625
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the dining facilities, Buildings 7245, 7606, and 7654. The HVAC system upgrades include the following: <ul style="list-style-type: none"> Replace existing single zone air handling units (AHUs) serving the dining areas with variable-air-volume (VAV) AHUs. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Replace existing make-up air handling units (MAUs) serving the kitchen areas with heat recovery air handling units (HRUs). The exhaust fans interlocked with the MAUs will be removed. Exhaust air ductwork will be provided at the roof exhaust air outlets and connected to the inlets on the HRUs. Replace the existing steam boiler serving both space heating and service water heating with separate boilers for each of the loads. An energy efficient hot water boiler will be installed for space heating. An energy efficient steam boiler will be installed for service water heating. 						
11. REQUIREMENT: <u>Project:</u> This Federal Energy Management Program (FEMP) project will replace the following HVAC systems in the dining facilities, Buildings 7245, 7606, and 7654: <ul style="list-style-type: none"> Replace the existing single zone AHUs with VAV AHUs Replace the MAUs with HRUs Replace the steam boiler serving both space and service water heating loads with separate boilers for each load. <u>Requirement:</u> This project is required to reduce the natural gas and electrical energy consumption of the existing single zone AHUs by replacement with VAV AHUs, of the existing MAUs by replacement with HRUs, and of the existing steam boiler by replacement with smaller energy efficient boilers. An immediate utility savings would be recognized. <u>Current Situation:</u> The dining facilities are single story, 14,000 sq ft buildings with single zone AHUs serving the dining areas, MAUs serving the kitchen areas, and a large steam boiler serving the space heating and service water heating loads.						

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		
4. PROJECT TITLE Upgrade HVAC Systems in Dining Facilities		5. PROJECT NUMBER
<p>11. REQUIREMENT (continued):</p> <p>Impact if Not Provided: If this project is not funded, a reduction of 15,117 MBtu/yr (15,933,318 MJ/yr) cannot be achieved. The Army will not realize a \$71,100 annual energy dollar savings with a 6.65 year simple payback and a savings-to-investment ratio (SIR) of 2.66. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.</p> <p>Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.</p> <p>Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.</p> <p>Amount of Energy Conserved: The amount of energy conserved is estimated to be 15,117 MBtu per year (15,933,318 MJ/yr).</p>		

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Upgrade HVAC Systems in Dining Facilities	FISCAL YEAR:	1995
ANALYSIS DATE:	05/24/95	ECONOMIC LIFE:	20
		PREPARED BY:	A. Niemeyer

1. INVESTMENT: Dining Facilities Buildings 7245, 7606, and 7654 - Replace SZ AHUs with VAV AHUs;

Replace MAUs with HRUs; Replace Large Steam Boiler with Smaller HW Boiler and Steam Boiler

A. CONSTRUCTION COST	=	\$558,179
B. SIOH COST	(5.5% of 1A) =	\$30,700
C. DESIGN COST	(6.0% of 1A) =	\$33,491
D. TOTAL COST	(1A + 1B + 1C) =	\$622,370
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$622,370

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	837	\$10,128	15.88	\$160,828
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	14,280	\$58,834	18.30	\$1,076,655
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$2,139	14.88	\$31,828
F. TOTAL		15,117	\$71,100		-----> \$1,269,311

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	(\$543)	14.88	(\$8,080)
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	(\$543)		(\$8,080)

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$460,107	5	0.863	\$397,072
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$460,107			\$397,072

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$388,993

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$93,563

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 6.65

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$1,658,304

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.66

(MUST HAVE SIR > 1.25 TO QUALIFY)

FEMP Project No. 2

Upgrade HVAC Systems in Dining Facilities
Buildings 7245, 7606, 7654

Backup Data

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade				SHEET 1 OF 1		DATE PREPARED 22-May-95	
ENGINEER		E M C Engineers, Inc.				ESTIMATOR		C. Wohler	
		Denver, CO				CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST		TOTAL	
				Quantity	Unit Cost	Total	Crew/ Worker		Hours/ Unit
1		BUILDING 7245							
2		PROPOSED SYSTEM MODIFICATIONS							
3									
4		NEW SYSTEMS INSTALLATION							
5	AHU8000	8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6	40	\$1,608
6	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33
7	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23
8	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	60.0	\$2.95	\$177	Q-1	0.2	\$233
9		FITTINGS ADD 5%				\$9			\$12
10	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	60.0	\$1.40	\$84	Q-14	0.08	\$88
11	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20
12	VSD5	VARIABLE SPEED DRIVE W/ CONTRLER,5HP	EA.	2.0	\$2,444.79	\$4,890	1-ELEC	21	\$879
13	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571
14	DTINSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145	Q-14	0.046	\$254
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25		EXISTING SYSTEMS DEMOLITION							
26		AHU DEMO	TON	2.8			Q-5	17.778	\$948
27									
28									
29									
30									
31		SUBTOTAL				\$14,751			\$4,670
32	OH	OVERHEAD			17%	\$2,478			\$785
33	PRO	PROFIT			10%	\$1,723			\$545
34	CONT	CONTINGENCY			20%	\$3,791			\$1,200
35	TOTAL COST					\$22,743			\$7,200

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade				SHEET 1 OF 1		DATE PREPARED 22-May-95	
ENGINEER		E M C Engineers, Inc. Denver, CO				ESTIMATOR		C. Wohler	
						CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST		
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7245							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	\$0

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade							
ENGINEER		E M C Engineers, Inc.							
		Denver, CO							
		SHEET		1		OF		1	
		DATE PREPARED 22-May-95							
		ESTIMATOR C. Wohliert							
		CHECKED BY A. Niemeyer							
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST		
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7245							
2		NON-RECURRING							
3									
4		EXISTING SYSTEM REPLACEMENT							
5	AHU8000	8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6	40	\$1,608
6	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571
7	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT. 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33
8	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23
9	STLPI1.5	STEEL PIPE SCH. 40, 1.5" WHANGERS	L.F.	60.0	\$2.95	\$177	Q-1	0.2	\$233
10		FITTINGS ADD 5%				\$9			\$12
11	INSLPI1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	60.0	\$1.40	\$84	Q-14	0.08	\$88
12	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20
13	DTINSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145	Q-14	0.046	\$254
14									
15									
16									
17									
18									
19									
20									
21									
22		EXISTING SYSTEMS DEMOLITION							
23		AHU DEMO	TON	2.8			Q-5	17.778	\$948
24									
25									
26									
27									
28									
29									
30									
31		SUBTOTAL				\$9,862			\$3,791
32	OH	OVERHEAD			17%	\$1,657			\$637
33	PRO	PROFIT			10%	\$1,152			\$443
34	CONT	CONTINGENCY			20%	\$2,534			\$974
35	TOTAL COST		-	-	-	\$15,205	-	-	\$5,845
									\$13,653
									\$2,294
									\$1,595
									\$3,508
									\$21,050

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR: 1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE: 20	PREPARED BY: C. Wohler

1. INVESTMENT: BLDG 7245 - Replace Kitchen MAUs & Exhaust w/ Heat Recovery Units

A. CONSTRUCTION COST	=	\$81,017
B. SIOH COST	(5.5% of 1A) =	\$4,456
C. DESIGN COST	(6.0% of 1A) =	\$4,861
D. TOTAL COST	(1A + 1B + 1C) =	\$90,334
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$90,334

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	JAN '95 DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	103	\$1,250	15.88	\$19,853
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,511	\$14,465	18.30	\$264,706
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$332	14.88	\$4,942
F. TOTAL		3,614	\$16,047		-----> \$289,501

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	ANNUAL \$	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
1	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$30,377	5	0.863	\$26,215
b.				\$0
c.				\$0
d. TOTAL	\$30,377			\$26,215
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)			(3A4 + 3Bd4) =	\$26,215

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bd1/Economic Life))	\$17,566
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	5.14
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$315,716
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	3.49
(MUST HAVE SIR > 1.25 TO QUALIFY)		

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7245								
2		PROPOSED SYSTEM MODIFICATIONS								
3		<i>NEW SYSTEMS INSTALLATION</i>								
4		KITCHEN HEAT RECOVERY UNIT, 19,000 CFM	EA.	1.0	\$28,294.80	\$28,295	Q-6	40	\$804	\$29,099
5	KHRU9C	KITCHEN HEAT RECOVERY UNIT, 8,500 CFM	EA.	1.0	\$17,442.00	\$17,442	Q-6	32	\$643	\$18,085
6	KHRU5	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	950.0	\$0.47	\$442	Q-10	0.094	\$1,735	\$2,177
7	DUCT1000	STEEL PIPE SCH. 40, 2" W/HANGERS	L.F.	50.0	\$3.91	\$196	Q-1	0.25	\$242	\$438
8	STLPIP2	FITTINGS, 5%				\$10			\$12	\$22
9		2" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	50.0	\$1.46	\$73	Q-14	0.084	\$77	\$151
10	INSLPIP2	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	Q-14	0.053	\$683	\$1,267
11	DTINSL2"									
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23		<i>EXISTING SYSTEM DEMOLITION</i>								
24		AHU DEMOLITION	TON	3.6			Q-5	17.778	\$1,241	\$1,241
25		DUCT DEMOLITION	TON	0.2			Q-5	17.778	\$69	\$69
26										
27										
28										
29										
30										
31		SUBTOTAL				\$47,041			\$5,508	\$52,548
32	OH	OVERHEAD			17%	\$7,903			\$925	\$8,828
33	PRO	PROFIT			10%	\$5,494			\$643	\$6,138
34	CONT	CONTINGENCY			20%	\$12,088			\$1,415	\$13,503
35	TOTAL COST					\$72,525			\$8,491	\$81,017

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT Fort Riley Feasibility Study for HVAC Upgrade									
ENGINEER E M C Engineers, Inc. Denver, CO									
SHEET 1 OF 1		DATE PREPARED 22-May-95		ESTIMATOR C. Wohler		CHECKED BY A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST		
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7245							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohliert
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7245								
2		NON-RECURRING								
3		NEW SYSTEMS INSTALLATION								
4										
5	AHU12000	12,000 CFM AHU, HEATING ONLY	EA.	1.0	\$5,499.08	\$5,499	Q-6	52.174	\$1,049	\$6,548
6	AHU3200	3,200 CFM AHU, HEATING ONLY	EA.	1.0	\$2,519.40	\$2,519	Q-5	20	\$388	\$2,907
7	AHU1300	1,300 CFM AHU, HEATING ONLY	EA.	1.0	\$1,913.78	\$1,914	Q-5	13.33	\$258	\$2,172
8	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	90.0	\$2.95	\$265	Q-1	0.2	\$349	\$614
9		FITTINGS, 5%				\$13			\$17	\$31
10	CNTV1.5	CONTROL VALVE 1-1/2"	EA.	3.0	\$276.17	\$828	1-PLUM	0.727	\$47	\$875
11	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	90.0	\$1.40	\$126	Q-14	0.08	\$133	\$258
12	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	450.0	\$0.47	\$209	Q-10	0.094	\$822	\$1,031
13	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	Q-14	0.053	\$683	\$1,267
14	EXHOD1.3	ROOF EXHAUSTER, 1,300 CFM	EA.	1.0	\$479.66	\$480	Q-20	4	\$77	\$556
15	EXHOD11	ROOF EXHAUSTER, 11,000 CFM	EA.	1.0	\$1,986.45	\$1,986	Q-20	10	\$192	\$2,178
16	EXHOD3.6	ROOF EXHAUSTER, 3,600 CFM	EA.	1.0	\$823.65	\$824	Q-20	5	\$96	\$920
17										
18										
19										
20										
21										
22		EXISTING SYSTEM DEMOLITION								
23		AHU DEMOLITION	TON	1.0			Q-5	17.778	\$345	\$345
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$15,247			\$4,455	\$19,703
32	OH	OVERHEAD			17%	\$2,562			\$749	\$3,310
33	PRO	PROFIT			10%	\$1,781			\$520	\$2,301
34	CONT	CONTINGENCY			20%	\$3,918			\$1,145	\$5,063
35	TOTAL COST					\$23,507			\$6,869	\$30,377

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohler

1. INVESTMENT: BLDG 7245 - Replace Large STM Boiler w/ Smaller STM & HW Boilers

A.	CONSTRUCTION COST	=	\$65,099
B.	SIQH COST	(5.5% of 1A) =	\$3,580
C.	DESIGN COST	(6.0% of 1A) =	\$3,906
D.	TOTAL COST	(1A + 1B + 1C) =	\$72,585
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F.	PUBLIC UTILITY COMPANY REBATE	=	\$0
G.	TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$72,585

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	(111)	(\$1,338)	15.88	(\$21,247)
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	1,528	\$6,295	18.30	\$115,205
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		1,417	\$4,957		-----> \$93,958

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1	ANNUAL MAINTENANCE	(\$181)	14.88	(\$2,693)
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST	(\$181)		(\$2,693)

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLACEMEN	\$101,942	5	0.863	\$87,976
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$101,942			\$87,976

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$85,284

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$9,874

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 7.35

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$179,241

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.47

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT		Fort Riley Feasibility Study for HVAC Upgrade	SHEET	1	OF	1
ENGINEER		E M C Engineers, Inc. Denver, CO	DATE PREPARED		22-May-95	
			ESTIMATOR		C. Wohler	
			CHECKED BY		A. Niemeyer	

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7245								
2		PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		BOILER, STEAM, 2 MBH, 85%	EA.	1.0	\$15,640	\$15,640	Q-7	35.556	\$731	\$16,371
5		BOILER, HOT WATER, 2 MBH, 85%	EA.	1.0	\$16,110	\$16,110	Q-7	32	\$658	\$16,768
6		STEEL PIPE SCH. 40, 2" WHANGERS	L.F.	90.0	\$3.91	\$352	Q-1	0.25	\$436	\$789
7	STLPIP2	VALVES & FITTINGS, 25%				\$88			\$109	\$197
8		2" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	90.0	\$1.46	\$132	Q-14	0.084	\$139	\$271
9	INSLPIP2	STEEL PIPE SCH. 40, 6" WHANGERS	L.F.	25.0	\$17.93	\$448	Q-16	0.667	\$362	\$810
10	STLPIP6	FITTINGS, 10%				\$45			\$36	\$81
11		6" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	25.0	\$2.18	\$55	Q-14	0.145	\$67	\$121
12	INSLPIP6	PUMP, 5 HP	EA	1.0	\$1,114.35	\$1,114	Q-1	8.889	\$172	\$1,287
13	PMP5HP									
14										
15										
16										
17										
18										
19										
20										
21		EXISTING SYSTEMS DEMOLITION								
22		BOILER DEMOLITION	EA.	1.0			Q-6	275	\$5,529	\$5,529
23										
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$33,984			\$8,240	\$42,224
32	OH	OVERHEAD			17%	\$5,709			\$1,384	\$7,094
33	PRO	PROFIT			10%	\$3,969			\$962	\$4,932
34	CONT	CONTINGENCY			20%	\$8,733			\$2,117	\$10,850
35	TOTAL COST					\$52,395			\$12,704	\$65,099

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade			SHEET 1 OF 1		DATE PREPARED 22-May-95		
ENGINEER		E M C Engineers, Inc. Denver, CO			ESTIMATOR		C. Wohlert		
					CHECKED BY		A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	
1		BUILDING 7245							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4	MNT-BLR	MAINT. ON BOILERS - >2.5 MBH	EA.	1.0	\$96.90	\$97	Q-6	25	\$503
5									\$600
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$97	-	-	\$503
16									\$600
17		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
18	MNT-BLR	MAINT. ON BOILERS - <2.5 MBH	EA.	2.0	\$48.45	\$97	Q-6	17	\$684
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$97	-	-	\$684
30									\$780
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	(\$181)

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR: 1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE: 20	PREPARED BY: C. Wohler

1. INVESTMENT: BLDG 7606 - Replace SZs AHUs In Dining area w/ VAV AHUs

A. CONSTRUCTION COST	=	\$29,943
B. SIOH COST	(5.5% of 1A) =	\$1,647
C. DESIGN COST	(6.0% of 1A) =	\$1,797
D. TOTAL COST	(1A + 1B + 1C) =	\$33,387
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$33,387

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	287	\$3,477	15.88	\$55,214
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(279)	(\$1,151)	18.30	(\$21,054)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$381	14.88	\$5,663
F. TOTAL		8	\$2,707		-----> \$39,823

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$21,050	5	0.863	\$18,166
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$21,050			\$18,166

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$18,166

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$3,759

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 8.88

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$57,988

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 1.74

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST										
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade				SHEET 1 OF 1		22-May-95		
ENGINEER		E M C Engineers, Inc.				ESTIMATOR		C. Wohler		
		Denver, CO				CHECKED BY		A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7606								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4		NEW SYSTEMS INSTALLATION								
5	AHU8000	8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6	40	\$1,608	\$10,475
6	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82
7	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23	\$34
8	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	60.0	\$2.95	\$177	Q-1	0.2	\$233	\$409
9		FITTINGS ADD 5%				\$9			\$12	\$20
10	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	60.0	\$1.40	\$84	Q-14	0.08	\$88	\$172
11	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20	\$402
12	VSD5	VARIABLE SPEED DRIVE W/ CONTRLER,5HP	EA.	2.0	\$2,444.79	\$4,890	1-ELEC	21	\$879	\$5,769
13	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571	\$711
14	DTINSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145	Q-14	0.046	\$254	\$399
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25		EXISTING SYSTEMS DEMOLITION								
26		AHU DEMO	TON	2.8			Q-5	17.778	\$948	\$948
27										
28										
29										
30										
31		SUBTOTAL				\$14,751			\$4,670	\$19,421
32	OH	OVERHEAD			17%	\$2,478			\$785	\$3,263
33	PRO	PROFIT			10%	\$1,723			\$545	\$2,268
34	CONT	CONTINGENCY			20%	\$3,791			\$1,200	\$4,991
35	TOTAL COST					\$22,743			\$7,200	\$29,943

ENGINEER'S OPINION OF PROBABLE COST

ENGINEER'S OPINION OF PROBABLE COST			
PROJECT	Fort Riley Feasibility Study for HVAC Upgrade		
ENGINEER	E M C Engineers, Inc. Denver, CO		
SHEET	1	OF	1
DATE PREPARED	22-May-95		
ESTIMATOR	C. Wohlerl		
CHECKED BY	A. Niemeyer		

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ENGINEER'S OPINION OF PROBABLE COST		
PROJECT	Fort Riley Feasibility Study for HVAC Upgrade	
ENGINEER	E M C Engineers, Inc. Denver, CO	
SHEET	1	OF
DATE PREPARED	22-May-95	
ESTIMATOR	C. Wohler	
CHECKED BY	A. Niemeyer	

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7606								
2		NON-RECURRING								
3										
4		EXISTING SYSTEM REPLACEMENT								
5	AHU8000	8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6	40	\$1,608	\$10,475
6	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571	\$711
7	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82
8	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23	\$34
9	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	60.0	\$2.95	\$177	Q-1	0.2	\$233	\$409
10		FITTINGS ADD 5%				\$9			\$12	\$20
11	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	60.0	\$1.40	\$84	Q-14	0.08	\$88	\$172
12	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20	\$402
13	DTINSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145	Q-14	0.046	\$254	\$399
14										
15										
16										
17										
18										
19										
20										
21										
22		EXISTING SYSTEMS DEMOLITION								
23	AHU DEMO		TON	2.8			Q-5	17.778	\$948	\$948
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$9,862			\$3,791	\$13,653
32	OH	OVERHEAD			17%	\$1,657			\$637	\$2,294
33	PRO	PROFIT			10%	\$1,152			\$443	\$1,595
34	CONT	CONTINGENCY			20%	\$2,534			\$974	\$3,508
35	TOTAL COST		-	-	-	\$15,205	-	-	\$5,845	\$21,050

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7606 - Replace Kitchen MAUs & Exhaust w/ Heat Recovery Units

A. CONSTRUCTION COST	=	\$81,017
B. SIOH COST	(5.5% of 1A) =	\$4,456
C. DESIGN COST	(6.0% of 1A) =	\$4,861
D. TOTAL COST	(1A + 1B + 1C) =	\$90,334
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$90,334

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	103	\$1,250	15.88	\$19,853
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,511	\$14,465	18.30	\$264,706
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$332	14.88	\$4,942
F. TOTAL		3,614	\$16,047		-----> \$289,501

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
1 ANNUAL MAINTENANCE			14.88	\$0
2			14.88	\$0
3			14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)				\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$30,377	5	0.863	\$26,215
b.				\$0
c.				\$0
d. TOTAL	\$30,377			\$26,215

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bd4) = \$26,215

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bd1/Economic Life)) \$17,566

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 5.14

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$315,716

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 3.49

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	
1		BUILDING 7606							
2		PROPOSED SYSTEM MODIFICATIONS							
3		<i>NEW SYSTEMS INSTALLATION</i>							
4		KITCHEN HEAT RECOVERY UNIT, 19,000 CFM	EA.	1.0	\$28,294.80	\$28,295	Q-6	40	\$804
5	KHRU9C	KITCHEN HEAT RECOVERY UNIT, 8,500 CFM	EA.	1.0	\$17,442.00	\$17,442	Q-6	32	\$643
6	KHRU5	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	950.0	\$0.47	\$442	Q-10	0.094	\$1,735
7	DUCT1000	STEEL PIPE SCH. 40, 2" W/HANGERS	L.F.	50.0	\$3.91	\$196	Q-1	0.25	\$242
8	STLPIP2	FITTINGS, 5%				\$10			\$12
9		2" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	50.0	\$1.46	\$73	Q-14	0.084	\$77
10	INSLPIP2	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	Q-14	0.053	\$683
11	DTINSL2"								
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23		EXISTING SYSTEM DEMOLITION							
24		AHU DEMOLITION	TON	3.6			Q-5	17.778	\$1,241
25		DUCT DEMOLITION	TON	0.2			Q-5	17.778	\$69
26									
27									
28									
29									
30									
31		SUBTOTAL				\$47,041			\$5,508
32	OH	OVERHEAD			17%	\$7,903			\$925
33	PRO	PROFIT			10%	\$5,494			\$643
34	CONT	CONTINGENCY			20%	\$12,088			\$1,415
35	TOTAL COST					\$72,525			\$8,491

\$29,099
\$18,085
\$2,177
\$438
\$22
\$151
\$1,267

\$1,241
\$69

\$52,548
\$8,828
\$6,138
\$13,503
\$81,017

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade						SHEET 1 OF 1	
ENGINEER		E M C Engineers, Inc. Denver, CO						DATE PREPARED 22-May-95	
								ESTIMATOR C. Wohler	
								CHECKED BY A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST		
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7606							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-		\$0	-		\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-		\$0	-		\$0
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-		\$0	-		\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohliert
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7606								
2		NON-RECURRING								
3		NEW SYSTEMS INSTALLATION								
4										
5	AHU12000	12,000 CFM AHU, HEATING ONLY	EA.	1.0	\$5,499.08	\$5,499	Q-6	52.174	\$1,049	\$6,548
6	AHU3200	3,200 CFM AHU, HEATING ONLY	EA.	1.0	\$2,519.40	\$2,519	Q-5	20	\$388	\$2,907
7	AHU1300	1,300 CFM AHU, HEATING ONLY	EA.	1.0	\$1,913.78	\$1,914	Q-5	13.33	\$258	\$2,172
8	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	90.0	\$2.95	\$265	Q-1	0.2	\$349	\$614
9		FITTINGS, 5%				\$13			\$17	\$31
10	CNTV1.5	CONTROL VALVE 1-1/2"	EA.	3.0	\$276.17	\$828	1-PLUM	0.727	\$47	\$875
11	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	90.0	\$1.40	\$126	Q-14	0.08	\$133	\$258
12	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	450.0	\$0.47	\$209	Q-10	0.094	\$822	\$1,031
13	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	Q-14	0.053	\$683	\$1,267
14	EXHOD1.3	ROOF EXHAUSTER, 1,300 CFM	EA.	1.0	\$479.66	\$480	Q-20	4	\$77	\$556
15	EXHOD11	ROOF EXHAUSTER, 11,000 CFM	EA.	1.0	\$1,986.45	\$1,986	Q-20	10	\$192	\$2,178
16	EXHOD3.6	ROOF EXHAUSTER, 3,600 CFM	EA.	1.0	\$823.65	\$824	Q-20	5	\$96	\$920
17										
18										
19										
20										
21										
22		EXISTING SYSTEM DEMOLITION								
23		AHU DEMOLITION	TON	1.0			Q-5	17.778	\$345	\$345
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$15,247			\$4,455	\$19,703
32	OH	OVERHEAD			17%	\$2,562			\$749	\$3,310
33	PRO	PROFIT			10%	\$1,781			\$520	\$2,301
34	CONT	CONTINGENCY			20%	\$3,918			\$1,145	\$5,063
35	TOTAL COST					\$23,507			\$6,869	\$30,377

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7606 - Replace Large STM Boiler w/ Smaller STM & HW Boilers

A.	CONSTRUCTION COST	=	\$80,100
B.	SIOH COST	(5.5% of 1A) =	\$4,406
C.	DESIGN COST	(6.0% of 1A) =	\$4,806
D.	TOTAL COST	(1A + 1B + 1C) =	\$89,312
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F.	PUBLIC UTILITY COMPANY REBATE	=	\$0
G.	TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$89,312

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	(111)	(\$1,338)	15.88	(\$21,247)
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	1,528	\$6,295	18.30	\$115,205
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		1,417	\$4,957		-----> \$93,958

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1	ANNUAL MAINTENANCE	(\$181)	14.88	(\$2,693)
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST	(\$181)		(\$2,693)

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3) (TABLE A-2)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLACEMEN	\$101,942	5	0.863	\$87,976
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$101,942			\$87,976

C.	TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =	\$85,284
----	---	----------------	----------

4.	FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bf1/Economic Life))	\$9,874
----	---	------------------------------------	---------

5.	SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	9.05
----	---	----------	------

6.	TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$179,241
----	------------------------------	--------------	-----------

7.	DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	2.01
	(MUST HAVE SIR > 1.25 TO QUALIFY)		

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7606								
2		PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		BOILER, STEAM, 2 MBH, 85%	EA.	1.0	\$15,640	\$15,640	Q-7	35.556	\$731	\$16,371
5		BOILER, HOT WATER, 2 MBH, 85%	EA.	1.0	\$16,110	\$16,110	Q-7	32	\$658	\$16,768
6		STEEL PIPE SCH. 40, 2" W/HANGERS	L.F.	90.0	\$3.91	\$352	Q-1	0.25	\$436	\$789
7	STLPIP2	VALVES & FITTINGS, 25%				\$88			\$109	\$197
8	INSLPIP2	2" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	90.0	\$1.46	\$132	Q-14	0.084	\$139	\$271
9	STLPIP6	STEEL PIPE SCH. 40, 6" W/HANGERS	L.F.	25.0	\$17.93	\$448	Q-16	0.667	\$362	\$810
10		FITTINGS, 10%				\$45			\$36	\$81
11	INSLPIP6	6" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	25.0	\$2.18	\$55	Q-14	0.145	\$67	\$121
12	PMP5HP	PUMP, 5 HP	EA	1.0	\$1,114.35	\$1,114	Q-1	8.889	\$172	\$1,287
13										
14										
15										
16										
17										
18										
19										
20										
21		EXISTING SYSTEMS DEMOLITION								
22		BOILER DEMOLITION	EA.	1.0			Q-6	275	\$5,529	\$5,529
23		ASBESTOS REMOVAL (HRU)	GLV. BAG	38.0	\$170.00	\$6,460				\$6,460
24		ASBESTOS REMOVAL (BOILER)	FLUE	1.0	\$3,270.00	\$3,270				\$3,270
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$43,714			\$8,240	\$51,954
32	OH	OVERHEAD			17%	\$7,344			\$1,384	\$8,728
33	PRO	PROFIT			10%	\$5,106			\$962	\$6,068
34	CONT	CONTINGENCY			20%	\$11,233			\$2,117	\$13,350
35		TOTAL COST				\$67,396			\$12,704	\$80,100

SHEET	1	OF	1
DATE PREPARED		22-May-95	
ESTIMATOR		C. Wohler	
CHECKED BY		A. Niemeyer	

[illegible]

Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	TOTAL
1		BUILDING 7606								
2		ANNUAL RECURRING								
3		ANNUAL MAINTENANCE COST - BASELINE								
4	MNT-BLR	MAINT. ON BOILERS - >2.5 MBH	EA.	1.0	\$96.90	\$97	Q-6	25	\$503	\$600
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$97	-	-	\$503	\$600
16										
17		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT								
18		MAINT. ON BOILERS - <2.5 MBH	EA.	2.0	\$48.45	\$97	Q-6	17	\$684	\$780
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$97	-	-	\$684	\$780
30										
31										
32										
33										
34										
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	(\$181)	(\$181)

ENGINEER'S OPINION OF PROBABLE COST										SHEET	1	OF	1
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade								DATE PREPARED		22-May-95	
ENGINEER		E M C Engineers, Inc. Denver, CO								ESTIMATOR		C. Wohler	
										CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL			
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total				
1		BUILDING 7606											
2		NON-RECURRING											
3													
4													
5	BOIL6.97	BASELINE - EXISTING EQUIP. REPLACEMENT	EA.		\$51,357	\$51,357							
6	STLPIP6	CAST IRON STEAM BOILER, 6.97 MBH	L.F.	1.0	\$17.93	\$448							
7		STEEL PIPE SCH. 40, 6" WHANGERS		25.0		\$45							
8		FITTINGS, 10%											
9	INSLPIP6	6" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	25.0	\$2.18	\$55							
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21		EXISTING SYSTEMS DEMOLITION	EA.										
22		BOILER DEMOLITION		1.0									
23													
24													
25													
26													
27													
28													
29													
30													
31		SUBTOTAL				\$51,904						\$14,216	\$66,121
32	OH	OVERHEAD			17%	\$8,720						\$2,388	\$11,108
33	PRO	PROFIT			10%	\$6,062						\$1,660	\$7,723
34	CONT	CONTINGENCY			20%	\$13,337						\$3,653	\$16,990
35		TOTAL COST				\$80,024						\$21,918	\$101,942

PROJECT		Fort Riley Feasibility Study for HVAC Upgrade				DATE PREPARED		22-May-95		
ENGINEER		E M C Engineers, Inc. Denver, CO				ESTIMATOR		C. Wohler		
						CHECKED BY		A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7606								
2		NON-RECURRING								
3										
4										
5	BOIL6.97	BASELINE - EXISTING EQUIP. REPLACEMENT	EA.	1.0	\$51,357	\$51,357	Q-7	400	\$8,222	\$59,579
6	STLPIP6	CAST IRON STEAM BOILER, 6.97 MBH	L.F.	25.0	\$17.93	\$448	Q-16	0.667	\$362	\$810
7		STEEL PIPE SCH. 40, 6" W/HANGERS				\$45			\$36	\$81
8	INSLPIP6	FITTINGS, 10%	L.F.	25.0	\$2.18	\$55	Q-14	0.145	\$67	\$121
9		6" FIBERGLASS PIPE INSULATION, 1.5" THCK								
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21		EXISTING SYSTEMS DEMOLITION	EA.	1.0			Q-6	275	\$5,529	\$5,529
22		BOILER DEMOLITION								
23										
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL			\$51,904	\$51,904			\$14,216	\$66,121
32	OH	OVERHEAD			17%	\$8,720			\$2,388	\$11,108
33	PRO	PROFIT			10%	\$6,062			\$1,660	\$7,723
34	CONT	CONTINGENCY			20%	\$13,337			\$3,653	\$16,990
35		TOTAL COST				\$80,024			\$21,918	\$101,942

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohlert

1. INVESTMENT: BLDG 7654 - Replace SZs AHUs In Dining area w/ VAV AHUs

A.	CONSTRUCTION COST	=	\$29,943
B.	SIOH COST	(5.5% of 1A) =	\$1,647
C.	DESIGN COST	(6.0% of 1A) =	\$1,797
D.	TOTAL COST	(1A + 1B + 1C) =	\$33,387
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F.	PUBLIC UTILITY COMPANY REBATE	=	\$0
G.	TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$33,387

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	287	\$3,477	15.88	\$55,214
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(279)	(\$1,151)	18.30	(\$21,054)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$381	14.88	\$5,663
F. TOTAL		8	\$2,707		-----> \$39,823

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1	ANNUAL MAINTENANCE	\$0	14.88	\$0
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
(TABLE A-2)				
a. BASELINE EQUIP. REPLCMNT.	\$21,050	5	0.863	\$18,166
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$21,050			\$18,166

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$18,166

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$3,759

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 8.88

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$57,988

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 1.74

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7654								
2		PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6	40	\$1,608	\$10,475
5	AHU8000	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82
6	E-TSTAT1	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23	\$34
7	WIRE#12	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	60.0	\$2.95	\$177	Q-1	0.2	\$233	\$409
8	STLPIP1.5	FITTINGS ADD 5%				\$9			\$12	\$20
9		1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	60.0	\$1.40	\$84	Q-14	0.08	\$88	\$172
10	INSLPIP1.5	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20	\$402
11	CNTV1	VARIABLE SPEED DRIVE W/ CONTRLER,5HP	EA.	2.0	\$2,444.79	\$4,890	1-ELEC	21	\$879	\$5,769
12	VSD5	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571	\$711
13	DUCT500	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145	Q-14	0.046	\$254	\$399
14	DTINSL1"									
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25		EXISTING SYSTEMS DEMOLITION								
26		AHU DEMO	TON	2.8			Q-5	17.778	\$948	\$948
27										
28										
29										
30										
31		SUBTOTAL				\$14,751				\$19,421
32	OH	OVERHEAD			17%	\$2,478			\$4,670	\$3,263
33	PRO	PROFIT			10%	\$1,723			\$785	\$2,268
34	CONT	CONTINGENCY			20%	\$3,791			\$1,200	\$4,991
35	TOTAL COST					\$22,743			\$7,200	\$29,943

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7654								
2		NON-RECURRING								
3		EXISTING SYSTEM REPLACEMENT								
4		8,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,433.18	\$8,866	Q-6	40	\$1,608	\$10,475
5	AHU8000		LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571	\$711
6	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82
7	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23	\$34
8	WIRE#12	COPPER WIRING #12	L.F.	60.0	\$2.95	\$177	Q-1	0.2	\$233	\$409
9	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS				\$9			\$12	\$20
10		FITTINGS ADD 5%				\$84	Q-14	0.08	\$88	\$172
11	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	60.0	\$1.40	\$84	Q-14	0.08	\$88	\$172
12	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20	\$402
13	DTINSL1"	DUCT INSULATION, 1" THICK	S.F.	300.0	\$0.48	\$145	Q-14	0.046	\$254	\$399
14										
15										
16										
17										
18										
19										
20										
21										
22		EXISTING SYSTEMS DEMOLITION								
23		AHU DEMO	TON	2.8			Q-5	17.778	\$948	\$948
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$9,862			\$3,791	\$13,653
32	OH	OVERHEAD			17%	\$1,657			\$637	\$2,294
33	PRO	PROFIT			10%	\$1,152			\$443	\$1,595
34	CONT	CONTINGENCY			20%	\$2,534			\$974	\$3,508
35	TOTAL COST			-	-	\$15,205	-	-	\$5,845	\$21,050

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7654 - Replace Kitchen MAUs & Exhaust w/ Heat Recovery Units

A. CONSTRUCTION COST	=	\$81,017
B. SIOH COST	(5.5% of 1A) =	\$4,456
C. DESIGN COST	(6.0% of 1A) =	\$4,861
D. TOTAL COST	(1A + 1B + 1C) =	\$90,334
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$90,334

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:				JAN '95	
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	103	\$1,250	15.88	\$19,853
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,511	\$14,465	18.30	\$264,706
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$332	14.88	\$4,942
F. TOTAL		3,614	\$16,047		-----> \$289,501

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE		\$0	14.88	\$0	
2		\$0	14.88	\$0	
3		\$0	14.88	\$0	
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)		\$0		\$0	
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
			(TABLE A-2)		
a. BASELINE EQUIP. REPLCMNT.	\$30,377	5	0.863	\$26,215	
b.				\$0	
c.				\$0	
d. TOTAL	\$30,377			\$26,215	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)			(3A4 + 3Bd4) =	\$26,215	

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bd1/Economic Life))	\$17,566
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	5.14
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$315,716
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	3.49
(MUST HAVE SIR > 1.25 TO QUALIFY)		

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7654								
2		PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		KITCHEN HEAT RECOVERY UNIT, 19,000 CFM	EA.	1.0	\$28,294.80	\$28,295	Q-6	40	\$804	\$29,099
5	KHRU9C	KITCHEN HEAT RECOVERY UNIT, 8,500 CFM	EA.	1.0	\$17,442.00	\$17,442	Q-6	32	\$643	\$18,085
6	KHRU5	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	950.0	\$0.47	\$442	Q-10	0.094	\$1,735	\$2,177
7	DUCT1000	STEEL PIPE SCH. 40, 2" W/HANGERS	L.F.	50.0	\$3.91	\$196	Q-1	0.25	\$242	\$438
8	STLPIP2	FITTINGS, 5%			\$10	\$10			\$12	\$22
9		2" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	50.0	\$1.46	\$73	Q-14	0.084	\$77	\$151
10	INSLPIP2	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	Q-14	0.053	\$683	\$1,267
11	DTINSL2"									
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23		EXISTING SYSTEM DEMOLITION								
24		AHU DEMOLITION	TON	3.6			Q-5	17.778	\$1,241	\$1,241
25		DUCT DEMOLITION	TON	0.2			Q-5	17.778	\$69	\$69
26										
27										
28										
29										
30										
31		SUBTOTAL				\$47,041			\$5,508	\$52,548
32	OH	OVERHEAD			17%	\$7,903			\$925	\$8,828
33	PRO	PROFIT			10%	\$5,494			\$643	\$6,138
34	CONT	CONTINGENCY			20%	\$12,088			\$1,415	\$13,503
35	TOTAL COST					\$72,525			\$8,491	\$81,017

ENGINEER'S OPINION OF PROBABLE COST											
PROJECT				SHEET 1 OF 1				DATE PREPARED 22-May-95			
ENGINEER				ESTIMATOR C. Wohler				CHECKED BY A. Niemeyer			
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL	
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total		
1		BUILDING 7654									
2		ANNUAL RECURRING									
3		ANNUAL MAINTENANCE COST - BASELINE									
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0		\$0
16											
17		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT									
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0		\$0
30											
31											
32											
33											
34											
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	\$0		\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7654								
2		NON-RECURRING								
3		NEW SYSTEMS INSTALLATION								
4										
5	AHU12000	12,000 CFM AHU, HEATING ONLY	EA.	1.0	\$5,499.08	\$5,499	Q-6	52.174	\$1,049	\$6,548
6	AHU3200	3,200 CFM AHU, HEATING ONLY	EA.	1.0	\$2,519.40	\$2,519	Q-5	20	\$388	\$2,907
7	AHU1300	1,300 CFM AHU, HEATING ONLY	EA.	1.0	\$1,913.78	\$1,914	Q-5	13.33	\$258	\$2,172
8	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	90.0	\$2.95	\$265	Q-1	0.2	\$349	\$614
9		FITTINGS, 5%				\$13			\$17	\$31
10	CNTV1.5	CONTROL VALVE 1-1/2"	EA.	3.0	\$276.17	\$828	1-PLUM	0.727	\$47	\$875
11	INSLPIP1.5	1.25" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	90.0	\$1.40	\$126	Q-14	0.08	\$133	\$258
12	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	450.0	\$0.47	\$209	Q-10	0.094	\$822	\$1,031
13	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	700.0	\$0.83	\$583	Q-14	0.053	\$683	\$1,267
14	EXHOD1.3	ROOF EXHAUSTER, 1,300 CFM	EA.	1.0	\$479.66	\$480	Q-20	4	\$77	\$556
15	EXHOD11	ROOF EXHAUSTER, 11,000 CFM	EA.	1.0	\$1,986.45	\$1,986	Q-20	10	\$192	\$2,178
16	EXHOD3.6	ROOF EXHAUSTER, 3,600 CFM	EA.	1.0	\$823.65	\$824	Q-20	5	\$96	\$920
17										
18										
19										
20										
21										
22		EXISTING SYSTEM DEMOLITION								
23		AHU DEMOLITION	TON	1.0			Q-5	17.778	\$345	\$345
24										
25										
26										
27										
28										
29										
30										
31										
32	OH	SUBTOTAL				\$15,247			\$4,455	\$19,703
33	PRO	OVERHEAD			17%	\$2,562			\$749	\$3,310
34	CONT	PROFIT			10%	\$1,781			\$520	\$2,301
35		CONTINGENCY			20%	\$3,918			\$1,145	\$5,063
		TOTAL COST				\$23,507			\$6,869	\$30,377

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade	FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE: 20	PREPARED BY: C. Wohlert

1. INVESTMENT: BLDG 7654 - Replace Large STM Boiler w/ Smaller STM & HW Boilers

A. CONSTRUCTION COST	=	\$80,100
B. SIOH COST	(5.5% of 1A) =	\$4,406
C. DESIGN COST	(6.0% of 1A) =	\$4,806
D. TOTAL COST	(1A + 1B + 1C) =	\$89,312
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$89,312

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	(111)	(\$1,338)	15.88	(\$21,247)
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	1,528	\$6,295	18.30	\$115,205
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		1,417	\$4,957		-----> \$93,958

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	(\$181)	14.88	(\$2,693)
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	(\$181)		(\$2,693)

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
(TABLE A-2)				
a. BASELINE EQUIP. REPLACEMEN	\$101,942	5	0.863	\$87,976
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$101,942			\$87,976

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$85,284

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$9,874

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 9.05

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$179,241

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.01

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT	Fort Riley Feasibility Study for HVAC Upgrade	SHEET	1	OF	1
ENGINEER	E M C Engineers, Inc. Denver, CO	DATE PREPARED	22-May-95		
		ESTIMATOR	C. Wohliert		
		CHECKED BY	A. Niemeyer		

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	
1		BUILDING 7654							
2		PROPOSED SYSTEM MODIFICATIONS							
3									
4		NEW SYSTEMS INSTALLATION							
5		BOILER, STEAM, 2 MBH, 85%	EA.	1.0	\$15,640	\$15,640	Q-7	35.556	\$731
6		BOILER, HOT WATER, 2 MBH, 85%	EA.	1.0	\$16,110	\$16,110	Q-7	32	\$658
7	STLPIP2	STEEL PIPE SCH. 40, 2" W/HANGERS	L.F.	90.0	\$3.91	\$352	Q-1	0.25	\$436
8		VALVES & FITTINGS, 25%			\$88	\$88			\$109
9	INSLPIP2	2" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	90.0	\$1.46	\$132	Q-14	0.084	\$139
10	STLPIP6	STEEL PIPE SCH. 40, 6" W/HANGERS	L.F.	25.0	\$17.93	\$448	Q-16	0.667	\$362
11		FITTINGS, 10%			\$45	\$45			\$36
12	INSLPIP6	6" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	25.0	\$2.18	\$55	Q-14	0.145	\$67
13	PMP5HP	PUMP, 5 HP	EA	1.0	\$1,114.35	\$1,114	Q-1	8.889	\$172
14									
15									
16									
17									
18									
19									
20									
21		EXISTING SYSTEMS DEMOLITION							
22		BOILER DEMOLITION	EA.	1.0			Q-6	275	\$5,529
23		ASBESTOS REMOVAL (HRU)	GLV. BAG	38.0	\$170.00	\$6,460			\$6,460
24		ASBESTOS REMOVAL (BOILER)	FLUE	1.0	\$3,270.00	\$3,270			\$3,270
25									
26									
27									
28									
29									
30									
31		SUBTOTAL				\$43,714			\$8,240
32	OH	OVERHEAD			17%	\$7,344			\$1,384
33	PRO	PROFIT			10%	\$5,106			\$962
34	CONT	CONTINGENCY			20%	\$11,233			\$2,117
35		TOTAL COST				\$67,396			\$12,704

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade				SHEET 1 OF 1		22-May-95	
ENGINEER		E M C Engineers, Inc. Denver, CO				ESTIMATOR		C. Wohler	
						CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST		
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7654							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4	MNT-BLR	MAINT. ON BOILERS - >2.5 MBH	EA.	1.0	\$96.90	\$97	Q-6	25	\$503
5									\$600
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$97	-	-	\$503
16									\$600
17		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
18	MNT-BLR	MAINT. ON BOILERS - <2.5 MBH	EA.	2.0	\$48.45	\$97	Q-6	17	\$684
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$97	-	-	\$684
30									\$780
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	(\$181)

FEMP Project No. 3

Upgrade HVAC Systems in Indoor Swimming Pools
Buildings 6940 and 8069

1. COMPONENT ARMY		FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95	
3. INSTALLATION AND LOCATION Fort Riley, Kansas				4. PROJECT TITLE Upgrade HVAC Systems in Indoor Swimming Pool Buildings		
5. PROGRAM ELEMENT		6. CATEGORY CODE		7. PROJECT NUMBER		8. PROJECT COST (\$000)
9. COST ESTIMATES						
ITEM				U/M	QUANTITY	COST (\$000)
Upgrade HVAC Systems in Indoor Swimming Pool Buildings				LS		335
TOTAL CONTRACT COST						335
SIOH (5.5%)						18
DESIGN COST (6.0%)						20
TOTAL PROJECT COST						373
Total Request (Rounded)						375
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the indoor swimming pools, Buildings 6940 and 8069. The HVAC system upgrades include the following: <ul style="list-style-type: none"> Replace the existing heating and ventilating unit (H&V) serving the swimming pool area of Building 6940 with a heat recovery air handling unit (HRU). Exhaust ductwork will be installed to exhaust the air out through the roof. A roof outlet will be installed for the exhaust air. The existing outside air ductwork will remain. Replace four existing H&Vs serving the swimming pool area of Building 8069 with two HRUs. Exhaust ductwork will be installed to exhaust the air out through the roof. A roof outlet will be installed for the exhaust air. The existing outside air ductwork will remain. 						
11. REQUIREMENT: <u>Project:</u> This Federal Energy Management Program (FEMP) project will replace the existing H&Vs with HRUs in the indoor swimming pools, Buildings 6940 and 8069. <u>Requirement:</u> This project is required to reduce the natural gas and electrical consumption by replacement of the existing H&Vs with HRUs. An immediate utility savings would be recognized. <u>Current Situation:</u> The indoor swimming pool, Building 6940, is a 23,450 sq ft single story building with the pool area heated and ventilated by a H&V. The indoor swimming pool and gymnasium, Building 8069, is a 25,620 sq ft two story building with the pool area heated and ventilated by four H&Vs.						

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA		2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas			
4. PROJECT TITLE Upgrade HVAC Systems in Indoor Swimming Pool Buildings			5. PROJECT NUMBER
<p>11. REQUIREMENT (continued):</p> <p>Impact if Not Provided: If this project is not funded, a reduction of 11,951 MBtu/yr (12,596,354 MJ/yr) cannot be achieved. The Army will not realize a \$57,226 annual energy dollar savings with a 6.32 year simple payback and a savings-to-investment ratio (SIR) of 2.81. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.</p> <p>Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.</p> <p>Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.</p> <p>Amount of Energy Conserved: The amount of energy conserved is estimated to be 11,951 MBtu per year (12,596,354 MJ/yr).</p>			

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Upgrade HVAC Systems in Indoor Swimming Pools	FISCAL YEAR:	1995
ANALYSIS DATE:	05/24/95	ECONOMIC LIFE:	20
		PREPARED BY:	A. Niemeyer

1. INVESTMENT: **Indoor Swimming Pools in Buildings 6940 and 8069 - Replace existing H&Vs with HRUs**

A. CONSTRUCTION COST	=	\$334,555
B. SIOH COST	(5.5% of 1A) =	\$18,401
C. DESIGN COST	(6.0% of 1A) =	\$20,073
D. TOTAL COST	(1A + 1B + 1C) =	\$373,029
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$373,029

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS: JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	1,001	\$12,112	15.88	\$192,340
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	10,950	\$45,114	18.30	\$825,586
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$0	14.88	\$0
F. TOTAL		11,951	\$57,226		-----> \$1,017,926

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3) (TABLE A-2)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$35,706	5	0.863	\$30,814
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$35,706			\$30,814

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$30,814

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$59,011

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 6.32

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$1,048,741

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.81

(MUST HAVE SIR > 1.25 TO QUALIFY)

FEMP Project No. 3

Upgrade HVAC Systems in Indoor Swimming Pools
Buildings 6940 and 8069

Backup Data

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade	FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20
		PREPARED BY:	C. Wohler

1. INVESTMENT: BLDG 6940 - Replace H&V Unit with Pool Heat Recovery Unit

A. CONSTRUCTION COST	=	\$178,678
B. SIOH COST	(5.5% of 1A) =	\$9,827
C. DESIGN COST	(6.0% of 1A) =	\$10,721
D. TOTAL COST	(1A + 1B + 1C) =	\$199,226
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$199,226

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:					<u>JAN '95</u>	
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)	
A. ELECT.	\$12.10	706	\$8,545	15.88	\$135,695	
B. DIST	\$0.00	0	\$0	19.16	\$0	
C. NAT GAS	\$4.12	7,727	\$31,836	18.30	\$582,608	
D. COAL	\$0.00	0	\$0	16.62	\$0	
E. ELEC. DEMAND			\$0	14.88	\$0	
F. TOTAL		8,434	\$40,381		-----> \$718,302	

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE		\$0	14.88	\$0	
2		\$0	14.88	\$0	
3		\$0	14.88	\$0	
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST		\$0		\$0	
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
			(TABLE A-2)		
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$0			\$0	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)			(3A4 + 3Bf4) =		\$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bf1/Economic Life))	\$40,381
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	4.93
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$718,302
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	3.61
(MUST HAVE SIR > 1.25 TO QUALIFY)		

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 6940								
2		PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		Z-PACK Heat Recovery Unit, 24,800 CFM	EA.	1.0	\$100,600	\$100,600	Q-6	100	\$2,011	\$102,611
5		STEEL PIPE SCH. 40, 3" W/HANGERS	L.F.	45.0	\$6.40	\$288	Q-15	0.372	\$325	\$612
6	STLPIP3	FITTINGS, 5%				\$14			\$16	\$31
7		CONTROL VALVE 2-1/2"	EA.	1.0	\$935.09	\$935	1-PLUM	3.556	\$77	\$1,012
8	CNTV2.5	3" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	45.0	\$1.66	\$75	Q-14	0.094	\$78	\$152
9	INSLPIP3	GAL. STEEL DUCTWORK, 2000 TO 5000 LB.	LB.	2600	\$0.45	\$1,159	Q-10	0.087	\$4,395	\$5,554
10	DUCT5000	ALUMINUM GALV. ROOF INTAKE, 25,000 CFM	EA.	1.0	\$3,972.90	\$3,973	Q-9	17.778	\$333	\$4,306
11	ROFEXH25	ROOF PENETRATION	EA.	1.0			Q-5	32	\$620	\$620
12		SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24	1-ELEC	0.8	\$17	\$41
13	E-TSTAT1	COPPER WIRING #12	C.L.F.	1.0	\$7.41	\$7	1-ELEC	0.727	\$15	\$23
14	WIRE#12									
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27		EXISTING SYSTEMS DEMOLITION								
28		AHU DEMO	TON	2.0			Q-5	17.778	\$689	\$689
29		DUCT DEMO	TON	0.7			Q-5	17.778	\$241	\$241
30										
31		SUBTOTAL				\$107,075			\$8,817	\$115,892
32	OH	OVERHEAD			17%	\$17,989			\$1,481	\$19,470
33	PRO	PROFIT			10%	\$12,506			\$1,030	\$13,536
34	CONT	CONTINGENCY			20%	\$27,514			\$2,266	\$29,780
35	TOTAL COST					\$165,084			\$13,594	\$178,678

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade	FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE: 20	PREPARED BY: C. Wohler

1. INVESTMENT: BLDG 8069 - Replace H&V Units with Pool Heat Recovery Units

A. CONSTRUCTION COST	=	\$155,877
B. SIOH COST	(5.5% of 1A) =	\$8,573
C. DESIGN COST	(6.0% of 1A) =	\$9,353
D. TOTAL COST	(1A + 1B + 1C) =	\$173,802
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$173,802

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	JAN '95 DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	295	\$3,563	15.88	\$56,588
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	3,223	\$13,277	18.30	\$242,964
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$0	14.88	\$0
F. TOTAL		3,517	\$16,840		-----> \$299,551

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
1 ANNUAL MAINTENANCE			14.88	\$0
2			14.88	\$0
3			14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST				\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$35,706	5	0.863	\$30,814
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$35,706			\$30,814

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$30,814

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$18,625

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 9.33

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$330,365

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 1.90

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT

Fort Riley Feasibility Study for HVAC Upgrade

ENGINEER E M C Engineers, Inc.

Denver, CO

SHEET

1

OF

1

DATE PREPARED	22-May-95
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ESTIMATOR	C. Wohler
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CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 8069								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4		NEW SYSTEMS INSTALLATION								
5		Z-PACK Heat Recovery Unit, 9,000 CFM	EA.	2.0	\$43,650	\$87,300	Q-6	63.37	\$2,548	\$89,848
6	STLPIP3	STEEL PIPE SCH. 40, 3" W/HANGERS	L.F.	200.0	\$6.40	\$1,279	Q-15	0.372	\$1,443	\$2,722
7		FITTINGS, 5%				\$64			\$72	\$136
8	INSLPIP3	3" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	200.0	\$1.66	\$331	Q-14	0.094	\$346	\$678
9	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	1260.0	\$0.47	\$586	Q-10	0.094	\$2,301	\$2,887
10	ROFEXH15	ALUMINUM GALV. ROOF INTAKE, 15,000 CFM	EA.	1.0	\$2,616.30	\$2,616	Q-9	12.3	\$231	\$2,847
11	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24	1-ELEC	0.8	\$17	\$41
12	WIRE#12	COPPER WIRING #12	C.L.F.	1.0	\$7.41	\$7	1-ELEC	0.727	\$15	\$23
13		ROOF PENETRATION	EA.	2.0			Q-5	14	\$543	\$543
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27		EXISTING SYSTEMS DEMOLITION								
28		AHU DEMO	TON	4.0			Q-5	17.778	\$1,379	\$1,379
29										
30										
31		SUBTOTAL				\$92,208				\$101,103
32	OH	OVERHEAD			17%	\$15,491			\$8,895	\$16,985
33	PRO	PROFIT			10%	\$10,770			\$1,039	\$11,809
34	CONT	CONTINGENCY			20%	\$23,694			\$2,286	\$25,979
35	TOTAL COST		-	-	-	\$142,163			\$13,713	\$155,877

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohliert
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 8069								
2		NON-RECURRING								
3										
4		EXISTING SYSTEM REPLACEMENT								
5	AHU5400	5,400 CFM AHU, HEATING ONLY	EA.	4.0	\$3,803.33	\$15,213	Q-6	30	\$2,413	\$17,626
6	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	500.0	\$0.47	\$233	Q-10	0.098	\$952	\$1,185
7	STLPIP1.25	STEEL PIPE SCH. 40, 1.25" W/HANGERS	L.F.	120.0	\$2.56	\$307	Q-1	0.2	\$465	\$772
8		FITTINGS ADD 5%				\$15			\$23	\$39
9	INSLPIP1.25	1.25" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	120.0	\$1.40	\$167	Q-14	0.08	\$177	\$344
10	CNTV1	CONTROL VALVE 1"	EA.	4.0	\$190.89	\$764	1-PLUM	0.471	\$41	\$804
11	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24	1-ELEC	0.8	\$17	\$41
12	WIRE#12	COPPER WIRING #12	C.L.F.	1.0	\$7.41	\$7	1-ELEC	0.727	\$15	\$23
13	DMP28X44	DAMPER W/ ACT, 28" X 44"	EA.	3.0	\$278.10	\$834	Q-9	2	\$112	\$947
14										
15										
16										
17										
18										
19										
20										
21										
22		EXISTING SYSTEMS DEMOLITION								
23		AHU DEMO	TON	4.0			Q-5	17.778	\$1,379	\$1,379
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$17,565			\$5,594	\$23,159
32	OH	OVERHEAD			17%	\$2,951			\$940	\$3,891
33	PRO	PROFIT			10%	\$2,052			\$653	\$2,705
34	CONT	CONTINGENCY			20%	\$4,514			\$1,437	\$5,951
35	TOTAL COST					\$27,081			\$8,625	\$35,706

FEMP Project No. 4

Upgrade HVAC Systems in Bowling Alley and Community
Activities Center

Bowling Alley - Building 7485
Community Activities Center - Building 6620

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas			4. PROJECT TITLE Upgrade HVAC Systems in Bowling Alley and Community Activities Center	
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
Upgrade HVAC Systems in Bowling Alley and Community Activities Center	LS			67
TOTAL CONTRACT COST				67
SIOH (5.5%)				4
DESIGN COST (6.0%)				4
TOTAL PROJECT COST				75
Total Request (Rounded)				80
<p>10. DESCRIPTION OF PROPOSED CONSTRUCTION</p> <p>The proposed construction consists of upgrading the HVAC systems in the Bowling Alley, Building 7485 and the Community Activities Center, Building 6620. The HVAC system upgrades include the following:</p> <ul style="list-style-type: none"> Convert the existing dual duct air handling unit (AHU) serving Building 7485 to a variable-air-volume (VAV) AHU. A variable speed drive (VSD) will be installed to control the supply fan speed. The existing dual duct mixing boxes will be replaced with dual duct VAV terminal units. The existing ductwork will remain. In Building 6620, replace two existing single zone air handling units (AHUs) serving the ballroom and the dining room with VAV AHUs. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Convert the existing multizone AHU serving Building 6620 to a VAV AHU. A VSD will be installed to control the supply fan speed. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. <p>11. REQUIREMENT:</p> <p>Project: This Federal Energy Management Program (FEMP) project will convert the existing dual duct AHU in Building 7485 to a dual duct VAV AHU. This project will also replace the existing single zone AHUs in Building 6620 with VAV AHUs and convert the existing multizone AHU to a VAV AHU.</p> <p>Requirement: This project is required to reduce natural gas and electrical energy consumption by replacement of existing single zone AHUs with VAV AHUs, by conversion of a dual duct AHU to a dual duct VAV AHU, and by conversion of a multizone AHU to a VAV AHU. An immediate utility savings would be recognized.</p> <p>Current Situation: The Bowling Alley, Building 7485, is a 36,970 sq ft single story building with the bowling lanes heated and cooled by a dual duct AHU. The Community Activities Center, Building 6620, is a 31,740 sq ft two story building with the ballroom and dining room heated and cooled by single zone AHUs, and an office administration area heated and cooled by a multizone AHU.</p>				

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		
4. PROJECT TITLE Upgrade HVAC Systems in Bowling Alley and Community Activities Center		5. PROJECT NUMBER
<p>11. REQUIREMENT (continued):</p> <p>Impact if Not Provided: If this project is not funded, a reduction of 1,039 MBtu/yr (1,095,106 MJ/yr) cannot be achieved. The Army will not realize a \$14,661 annual energy dollar savings with a 4.65 year simple payback and a savings-to-investment ratio (SIR) of 3.41. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.</p> <p>Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.</p> <p>Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.</p> <p>Amount of Energy Conserved: The amount of energy conserved is estimated to be 1,039 MBtu per year (1,095,106 MJ/yr).</p>		

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO: 1406-005
PROJECT TITLE:	Upgrade HVAC Systems in Bowling Alley and Community Activiti		FISCAL YEAR: 1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE: 20	PREPARED BY: A. Niemeyer

Building 7485 - Convert existing DD AHU to a DD VAV AHU; Building 6620 - Replace existing

1. INVESTMENT: **Building 6620 - Replace existing SZ AHUs with VAV AHUs, and Convert existing MZ AHU to a VAV AHU**

A. CONSTRUCTION COST	=	\$67,449
B. SIOH COST	(5.5% of 1A) =	\$3,710
C. DESIGN COST	(6.0% of 1A) =	\$4,047
D. TOTAL COST	(1A + 1B + 1C) =	\$75,206
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$75,206

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS: JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	1,142	\$13,818	15.88	\$219,433
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(103)	(\$424)	18.30	(\$7,766)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$1,267	14.88	\$18,853
F. TOTAL		1,039	\$14,661		-----> \$230,520

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$30,326	5	0.863	\$26,171
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$30,326			\$26,171

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$26,171

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$16,177
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 4.65
6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$256,692
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 3.41
 (MUST HAVE SIR > 1.25 TO QUALIFY)

FEMP Project No. 4

Upgrade HVAC Systems in Bowling Alley and Community Activities Center

Bowling Alley - Building 7485
Community Activities Center - Building 6620

Backup Data

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohlert

1. INVESTMENT: BLDG 6620 - Replace SZs AHUs w/ VAV AHUs

A.	CONSTRUCTION COST	=	\$42,220
B.	SIQH COST	(5.5% of 1A) =	\$2,322
C.	DESIGN COST	(6.0% of 1A) =	\$2,533
D.	TOTAL COST	(1A + 1B + 1C) =	\$47,075
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F.	PUBLIC UTILITY COMPANY REBATE	=	\$0
G.	TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$47,075

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	478	\$5,778	15.88	\$91,760
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	199	\$821	18.30	\$15,016
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$539	14.88	\$8,016
F. TOTAL		677	\$7,138		-----> \$114,793

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1	ANNUAL MAINTENANCE	\$0	14.88	\$0
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
(TABLE A-2)				
a. BASELINE EQUIP. REPLCMNT.	\$30,326	5	0.863	\$26,171
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$30,326			\$26,171

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$26,171

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$8,654

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 5.44

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$140,964

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.99

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 6620								
2		PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		10,000 CFM AHU, COOLING ONLY	EA.	2.0	\$4,820.78	\$9,642	Q-6	44.44	\$1,787	\$11,429
5	AHU10000	REHEAT COIL, 2ROW, 3' x 2'	EA.	2.0	\$193.80	\$388	Q-5	3.96	\$154	\$541
6	REHEAT4	REHEAT COIL, 2ROW, 3'x1'	EA.	2.0	\$154.07	\$308	Q-5	1.3	\$51	\$359
7	REHEAT3	VAV BOX, 3500 CFM, ELEC	EA.	2.0	\$310.08	\$620	1-SHEE	1.48	\$62	\$682
8	VAVBX35	VAV BOX, 7000 CFM, ELEC	EA.	2.0	\$353.69	\$707	1-SHEE	2.6	\$108	\$816
9	VAVBX70	STEEL PIPE SCH. 40, 1" W/HANGERS	L.F.	145.0	\$2.10	\$305	Q-1	0.151	\$425	\$729
10	STLPIP1	STEEL PIPE SCH. 40, 2.5" W/HANGERS	L.F.	120.0	\$5.28	\$634	Q-15	0.34	\$791	\$1,425
11	STLPIP2.5	FITTINGS, 5%				\$47			\$61	\$108
12		SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	4.0	\$24.23	\$97	1-ELEC	0.8	\$67	\$164
13	E-TSTAT1	COPPER WIRING #12	C.L.F.	3.0	\$7.41	\$22	1-ELEC	0.73	\$46	\$68
14	WIRE#12	VARIABLE SPEED DRIVE W/ CONTRLER, 7.5HP	EA.	2.0	\$2,728.70	\$5,457			\$523	\$5,981
15	VSD7.5	CONTROL VALVE 3/4"	EA.	4.0	\$153.10	\$612	1-PLUM	0.44	\$38	\$651
16	CNTV0.75	CONTROL VALVE 2"	EA.	2.0	\$397.29	\$795	1-PLUM	0.889	\$38	\$833
17	CNTV2	1" FIBERGLASS PIPE INSULATION, 1" THICK	L.F.	145.0	\$0.62	\$90	Q-14	0.073	\$195	\$285
18	INSLPIP1	2.5" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	120.0	\$1.60	\$192	Q-14	0.089	\$197	\$389
19	INSLPIP2.5	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	425.0	\$0.47	\$198	Q-10	0.098	\$809	\$1,007
20	DUCT500	DUCT INSULATION, 2" THICK	S.F.	356.0	\$0.83	\$297	Q-14	0.053	\$347	\$644
21	DTINSL2"									
22										
23										
24										
25										
26										
27		EXISTING SYSTEMS DEMOLITION								
28		AHU DEMO	TON	3.7			Q-5	17.778	\$1,275	\$1,275
29										
30										
31		SUBTOTAL				\$20,410			\$6,974	\$27,384
32	OH	OVERHEAD			17%	\$3,429			\$1,172	\$4,601
33	PRO	PROFIT			10%	\$2,384			\$815	\$3,198
34	CONT	CONTINGENCY			20%	\$5,245			\$1,792	\$7,037
35	TOTAL COST					\$31,467			\$10,753	\$42,220

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade				SHEET 1 OF 1		DATE PREPARED 22-May-95	
ENGINEER		E M C Engineers, Inc. Denver, CO				ESTIMATOR		C. Wohler	
						CHECKED BY		A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST		
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 6620							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 6620								
2		NON-RECURRING								
3										
4		EXISTING SYSTEM REPLACEMENT								
5	AHUH10000	10,000 CFM AHU	EA.	2.0	\$5,784.93	\$11,570	Q-6	46.67	\$1,877	\$13,446
6	STLPIP2.5	STEEL PIPE SCH. 40, 2.5" W/HANGERS	L.F.	120.0	\$5.28	\$634	Q-15	0.34	\$791	\$1,425
7		FITTINGS, 5%				\$32			\$40	\$71
8	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82
9	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.73	\$23	\$34
10	CNTV2	CONTROL VALVE 2"	EA.	4.0	\$397.29	\$1,589	1-PLUM	0.889	\$77	\$1,666
11	INSLPIP2.5	2.5" FIBERGLASS PIPE INSULATION, 1.5" THICK	L.F.	120.0	\$1.60	\$192	Q-14	0.089	\$197	\$389
12	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	350.0	\$0.47	\$163	Q-10	0.098	\$666	\$829
13	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	250.0	\$0.83	\$208	Q-14	0.053	\$244	\$452
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27		EXISTING SYSTEMS DEMOLITION								
28		AHU DEMO	TON	3.7			Q-5	17.778	\$1,275	\$1,275
29										
30										
31		SUBTOTAL				\$14,447			\$5,223	\$19,670
32	OH	OVERHEAD			17%	\$2,427			\$877	\$3,304
33	PRO	PROFIT			10%	\$1,687			\$610	\$2,297
34	CONT	CONTINGENCY			20%	\$3,712			\$1,342	\$5,054
35	TOTAL COST			-	-	\$22,274	-	-	\$8,052	\$30,326

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 6620 - Convert MZ AHU to VAV AHU

A.	CONSTRUCTION COST	=	\$11,727
B.	SIQH COST	(5.5% of 1A) =	\$645
C.	DESIGN COST	(6.0% of 1A) =	\$704
D.	TOTAL COST	(1A + 1B + 1C) =	\$13,076
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F.	PUBLIC UTILITY COMPANY REBATE	=	\$0
G.	TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$13,076

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:					<u>JAN '95</u>	
ENERGY	FUEL COS	SAVINGS	ANNUAL \$	DISCOUNT	DISCOUNTED	
SOURCE	\$/MBTU (1)	MBTU/YR (2)	SAVINGS (3)	FACTOR (4)	SAVINGS (5)	
A. ELECT.	\$12.10	176	\$2,129	15.88	\$33,807	
B. DIST	\$0.00	0	\$0	19.16	\$0	
C. NAT GAS	\$4.12	(9)	(\$35)	18.30	(\$641)	
D. COAL	\$0.00	0	\$0	16.62	\$0	
E. ELEC. DEMAND			(\$122)	14.88	(\$1,808)	
F. TOTAL		167	\$1,972		-----> \$31,358	

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)					
1	ANNUAL MAINTENANCE	\$0	14.88	\$0	
2		\$0	14.88	\$0	
3		\$0	14.88	\$0	
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0		\$0	
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+)	YEAR OF	DISCOUNT	DISCOUNTED	
	COST (-) (1)	OCCURRENCE (2)	FACTOR (3)	SAVINGS/COST (4)	
(TABLE A-2)					
a.	BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.					\$0
c.					\$0
d.					\$0
e.					\$0
f.	TOTAL	\$0			\$0
C.	TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A4 + 3Bf4) =			\$0

4.	FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bf1/Economic Life))	\$1,972
5.	SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	6.63
6.	TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$31,358
7.	DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	2.40
	(MUST HAVE SIR > 1.25 TO QUALIFY)		

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 6620								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4		MZ AHU CONVERSION TO VAV								
5	VAVBX5	VAV BOX, 500 CFM, ELEC	EA.	2.0	\$266.48	\$533	1-SHEE	0.98	\$41	\$574
6	VAVBX8	VAV BOX, 800 CFM, ELEC	EA.	1.0	\$269.38	\$269	1-SHEE	1.0	\$21	\$290
7	VAVBX20	VAV BOX, 2000 CFM, ELEC	EA.	2.0	\$279.07	\$558	1-SHEE	1.22	\$51	\$609
8	VAVBX35	VAV BOX, 3500 CFM, ELEC	EA.	2.0	\$310.08	\$620	1-SHEE	1.48	\$62	\$682
9	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	7.0	\$24.23	\$170	1-ELEC	0.8	\$117	\$287
10	WIRE#12	COPPER WIRING #12	C.L.F.	3.5	\$7.41	\$26	1-ELEC	0.73	\$53	\$79
11	VSD7.5	VARIABLE SPEED DRIVE W/ CONTRLER, 7.5HP	EA.	1.0	\$2,728.70	\$2,729	1-ELEC	12.5	\$262	\$2,990
12	ELE-SWIT	DDC SWITCH	EA.	1.0	\$69.77	\$70	1-STPI	0.5	\$11	\$81
13	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.094	\$548	\$687
14	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	250.0	\$0.83	\$208	Q-14	0.053	\$244	\$452
15	ACTUAT	SMALL ELECTRIC ACTUATOR	EA.	7.0	\$96.90	\$678	1-ELEC	0.35	\$51	\$730
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27		EXISTING SYSTEMS DEMOLITION								
28		SELECTIVE DUCT DEMOLITION	LB	300.0			Q-5	0.025	\$145	\$145
29										
30										
31		SUBTOTAL				\$6,001			\$1,606	\$7,606
32	OH	OVERHEAD			17%	\$1,008			\$270	\$1,278
33	PRO	PROFIT			10%	\$701			\$188	\$888
34	CONT	CONTINGENCY			20%	\$1,542			\$413	\$1,955
35	TOTAL COST					\$9,252			\$2,475	\$11,727

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7485 - Convert DD AHUs to DDs with VAV Units

A. CONSTRUCTION COST	=	\$13,502
B. SIOH COST	(5.5% of 1A) =	\$743
C. DESIGN COST	(6.0% of 1A) =	\$810
D. TOTAL COST	(1A + 1B + 1C) =	\$15,055
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$15,055

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	488	\$5,907	15.88	\$93,805
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(293)	(\$1,205)	18.30	(\$22,055)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$850	14.88	\$12,642
F. TOTAL		196	\$5,552		-----> \$84,392

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$0	5	0.863	\$0
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$0			\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$0

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$5,552

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 2.71

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$84,392

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 5.61

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohliert
CHECKED BY A. Niemeier

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7485								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4	VSD20	VARIABLE SPEED DRIVE W/ CONTRLER, 20HP	EA.	1	\$4,844.03	\$4,844	1-ELEC	19	\$398	\$5,242
5	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	12	\$24.23	\$291	1-ELEC	0.8	\$201	\$492
6	WIRE#12	COPPER WIRING #12	C.L.F.	8	\$7.41	\$62	1-ELEC	0.727	\$128	\$190
7	VAVBX8	VAV BOX, 800 CFM, ELEC	EA.	19	\$331.40	\$6,297	1-SHEE	1.5	\$593	\$6,890
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25		EXISTING SYSTEMS DEMOLITION								
26		DUAL DUCT MIXING BOX DEMO	EA.	19.0			1-SHEE	3	\$1,186	\$1,186
27										
28										
29										
30										
31		SUBTOTAL				\$6,650			\$2,108	\$8,758
32	OH	OVERHEAD			17%	\$1,117			\$354	\$1,471
33	PRO	PROFIT			10%	\$777			\$246	\$1,023
34	CONT	CONTINGENCY			20%	\$1,709			\$542	\$2,250
35	TOTAL COST			-	-	\$10,252	-	-	\$3,250	\$13,502

FEMP Project No. 5

Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool
Admin, and Battalion Headquarters

Fire Station - Building 5000

Unit Chapel - Building 7086

Motor Pool Admin - Building 7178

Battalion Headquarters - Building 7806

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE MAY 95	
3. INSTALLATION AND LOCATION Fort Riley, Kansas			4. PROJECT TITLE Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin and Battalion Headquarters		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin, and Battalion Headquarters	LS			97	
TOTAL CONTRACT COST				97	
SIOH (5.5%)				5	
DESIGN COST (6.0%)				6	
TOTAL PROJECT COST				108	
Total Request (Rounded)				110	
10. DESCRIPTION OF PROPOSED CONSTRUCTION The proposed construction consists of upgrading the HVAC systems in the Fire Station - Building 5000, the Unit Chapel - Building 7086, the Motor Pool Admin - Building 7178, and the Battalion Headquarters - Building 7806. The HVAC system upgrades include the following: <ul style="list-style-type: none"> Replace the existing multizone air handling unit (AHU) serving Building 5000 with three furnace air conditioning units (FACs). The supply air ductwork will be modified to serve three zones instead of the existing five zones. The existing air cooled condensing unit (ACCU) will be replaced with three ACCUs each serving the FACs. The existing boiler will be replaced with a smaller modular HW boiler, and will serve the heating and ventilating unit only. Replace the existing single zone AHU serving Building 7086 with a variable-air-volume (VAV) AHU. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. Replace three existing window air conditioners (WACs) serving Building 7178 with a single zone AHU. Supply air ductwork with supply grilles will be installed. An ACCU will be installed to provide cooling to the single zone AHU. Replace two existing single zone AHUs serving Building 7806 with VAV AHUs. VAV terminal units with reheat coils will be installed on the zone supply air ducts. The existing ductwork will remain. 					
11. REQUIREMENT: <u>Project:</u> This Federal Energy Management Program (FEMP) project will replace the existing multizone AHU in Building 5000 with three FACs. Also in Building 5000, the existing ACCU will be replaced with three smaller ACCUs, and the HW boiler will be replaced with a smaller HW boiler. This project will also replace the existing single zone AHU in Building 7086 with a VAV AHU; replace three WACs with a single zone AHU and an ACCU in Building 7178; and replace two single zone AHUs with VAV AHUs in Building 7806.					

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE MAY 95
3. INSTALLATION AND LOCATION Fort Riley, Kansas		
4. PROJECT TITLE Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin and Battalion Headquarters		5. PROJECT NUMBER
<p>11. REQUIREMENT (continued):</p> <p>Requirement: This project is required to reduce natural gas and electrical energy consumption by replacement of a multizone AHU with three FACs; by replacement of an existing ACCU with three smaller ACCUs and an existing HW boiler with a smaller modular HW boiler; by replacement of three WACs with a single zone AHU and ACCU; and by replacment of existing single zone AHUs with VAV AHUs. An immediate utility savings would be recognized.</p> <p>Current Situation: The Fire Station, Building 5000, is a 8,400 sq ft single story building with the quarters and communication center heated and cooled by a multizone AHU. The Unit Chapel, Building 7086, is a 8,700 sq ft single story building with the church sanctuary heated and cooled by a single zone AHU. The Motor Pool Admin, Building 7178, is a 2,480 sq ft single story building cooled by three WACs. The Battalion Headquarters, Building 7806 is a 13,490 sq ft single story building heated and cooled by two single zone AHUs.</p> <p>Impact if Not Provided: If this project is not funded, a reduction of 712 MBtu/yr (750,448 MJ/yr) cannot be achieved. The Army will not realize a \$8,533 annual energy dollar savings with a 7.36 year simple payback and a savings-to-investment ratio (SIR) of 2.23. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.</p> <p>Supporting Documentation: Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (EMC Engineers, Inc.) in FY95.</p> <p>Verification of Savings: The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the FEMP project implementation can be compared to the energy use for billing periods subsequent to the FEMP project implementation.</p> <p>Amount of Energy Conserved: The amount of energy conserved is estimated to be 712 MBtu per year (750,448 MJ/yr).</p>		

LIFE CYCLE COST ANALYSIS SUMMARY
FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

LOCATION: Fort Riley REGION: 2 (Kansas) PROJECT NO: 1406-005
 PROJECT TITLE: Upgrade HVAC Sys'ts in Fire Stn, Chpl, Mtr Pl Admin, and Bn HQ FISCAL YEAR: 1995
 ANALYSIS DATE: 05/24/95 ECONOMIC LIFE: 20 PREPARED BY: A. Niemeyer

**Building 5000 - Replace existing MZ AHU with FACs, also replace ACCU with three smaller ACCUs
 and replace HW boiler with smaller modular HW boiler;**

Building 7086 - Replace SZ AHU with VAV AHU;

Building 7178 - Replace three WACs with SZ AHU and ACCU;

Building 7806 - Replace SZ AHUs with VAV AHUs

1. INVESTMENT:

A. CONSTRUCTION COST	=	\$96,904
B. SIOH COST	(5.5% of 1A) =	\$5,330
C. DESIGN COST	(6.0% of 1A) =	\$5,814
D. TOTAL COST	(1A + 1B + 1C) =	\$108,048
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$108,048

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NIST 85-3273-9 USED FOR DISCOUNT FACTORS:					JAN '95
ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	489	\$5,917	15.88	\$93,960
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	223	\$919	18.30	\$16,813
D. COAL	\$0.00	0	\$0	16.62	\$0
E. DEMAND (KW)			\$1,697	14.88	\$25,251
F. TOTAL		712	\$8,533		-----> \$136,025

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)					
1 ANNUAL MAINTENANCE		\$511	14.88		\$7,604
2		\$0	14.88		\$0
3		\$0	14.88		\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST		\$511			\$7,604
B. NON-RECURRING (+/-)					
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)	
(TABLE A-2)					
a. BASELINE EQUIP. REPLCMNT.	\$112,934	5	0.863	\$97,462	
b.				\$0	
c.				\$0	
d.				\$0	
e.				\$0	
f. TOTAL	\$112,934			\$97,462	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)			(3A4 + 3Bf4) =		\$105,066

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bf1/Economic Life))	\$14,690
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	7.36
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$241,091
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	2.23
(MUST HAVE SIR > 1.25 TO QUALIFY)		

FEMP Project No. 5

Upgrade HVAC Systems in Fire Station, Unit Chapel, Motor Pool Admin, and
Battalion Headquarters

Fire Station - Building 5000

Unit Chapel - Building 7086

Motor Pool Admin - Building 7178

Battalion Headquarters - Building 7806

Backup Data

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohler

1. INVESTMENT: BLDG 5000 - Replace MZ AHU w/ 3 Furnace Air Conditioning Units

A. CONSTRUCTION COST	=	\$37,026
B. SIOH COST	(5.5% of 1A) =	\$2,036
C. DESIGN COST	(6.0% of 1A) =	\$2,222
D. TOTAL COST	(1A + 1B + 1C) =	\$41,284
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$41,284

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	82	\$991	15.88	\$15,737
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	196	\$808	18.30	\$14,793
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			(\$47)	14.88	(\$701)
F. TOTAL		278	\$1,752		-----> \$29,829

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
1 ANNUAL MAINTENANCE			14.88	\$9,696
2			14.88	\$0
3			14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST				\$9,696

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$72,986	5	0.863	\$62,987
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$72,986			\$62,987

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$72,683

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$6,053

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 6.82

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$102,511

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.48

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 5000								
2		PROPOSED SYSTEM MODIFICATIONS								
3		NEW SYSTEMS INSTALLATION								
4		FURNACE AIR CONDITIONER, 4 TON	EA.	1.0	\$1,782.96	\$1,783	Q-9	20	\$375	\$2,158
5	FAC1	FURNACE AIR CONDITIONER, 5 - 6 TON	EA.	2.0	\$2,596.92	\$5,194	Q-10	24	\$933	\$6,126
6	FAC2	4 TON ACCU	EA.	1.0	\$1,405.05	\$1,405	Q-5	17.778	\$345	\$1,750
7	ACCU4	5 TON ACCU	EA.	1.0	\$1,719.98	\$1,720	Q-5	26.667	\$517	\$2,237
8	ACCU5	7.5 TON ACCU	EA.	1.0	\$3,125.03	\$3,125	Q-5	29.091	\$564	\$3,689
9	ACCU7.5	COPPER TUBE, TYPE L, 3/4" OD	L.F.	225.0	\$1.41	\$316	1-PLUM	0.103	\$499	\$815
10	MCUPIP1	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	600.0	\$0.47	\$279	Q-10	0.094	\$1,096	\$1,375
11	DUCT100	10 IN. DIA. FLEX DUCT	L.F.	10.0	\$2.55	\$25	Q-9	0.114	\$21	\$47
12	10"FLEX	MODULAR HW BOILER, 320 MBH	EA.	1.0	\$2,640.53	\$2,641	Q-7	40	\$822	\$3,463
13	MODBLR1	1/3 HP, CI FLANGE, IN-LINE, 3/4"-1-1/2" SIZE	EA.	1.0	\$300.39	\$300	Q-1	2.667	\$52	\$352
14	HWP1									
15										
16										
17										
18										
19										
20										
21		EXISTING SYSTEMS DEMOLITION								
22		BOILER DEMOLITION	EA.	1.0			Q-6	12	\$241	\$241
23		MZ AHU DEMOLITION	TON	1.0			Q-5	14.545	\$282	\$282
24		HOT WATER PIPING DEMOLITION	L.F.	50.0			1-PLUM	0.04	\$43	\$43
25		DUCTWORK DEMOLITION	L.F.	50.0			1-CLAB	0.107	\$77	\$77
26		ASBESTOS REMOVAL	GLV. BAG	8.0	\$170.00	\$1,360				\$1,360
27										
28										
29										
30										
31		SUBTOTAL				\$18,148			\$5,867	\$24,016
32	OH	OVERHEAD			17%	\$3,049			\$986	\$4,035
33	PRO	PROFIT			10%	\$2,120			\$685	\$2,805
34	CONT	CONTINGENCY			20%	\$4,663			\$1,508	\$6,171
35	TOTAL COST					\$27,981			\$9,046	\$37,026

ENGINEER'S OPINION OF PROBABLE COST

PROJECT		Fort Riley Feasibility Study for HVAC Upgrade	SHEET	1	OF	1
ENGINEER		E M C Engineers, Inc. Denver, CO	DATE PREPARED 22-May-95			
			ESTIMATOR C. Wohler			
			CHECKED BY A. Niemeyer			

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 5000								
2		NON-RECURRING								
3										
4										
5	HWBLR1	BASELINE - EXISTING EQUIP. REPLACEMENT	EA.	1.0	\$5,354	\$5,354	Q-7	58.182	\$1,196	\$6,550
6	MZ15TON	765 MBH HOT WATER BOILER (Cast Iron)	EA.	1.0	\$31,115	\$31,115	Q-7	145	\$2,980	\$34,095
7	ACCU15	15 TON MULTIZONE AHU	EA.	1.0	\$5,184	\$5,184	Q-5	40	\$776	\$5,960
8		15 TON ACCU								
9										
10										
11										
12										
13										
14		EXISTING SYSTEMS DEMOLITION	EA.	1.0			Q-6	12	\$241	\$241
15		BOILER DEMOLITION	TON	1.0			Q-5	14.545	\$282	\$282
16		MZ AHU DEMOLITION	TON	0.8			Q-5	14.545	\$212	\$212
17		ACCU DEMOLITION								
18										
19			0							
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$41,652			\$5,687	\$47,339
32	OH	OVERHEAD			17%	\$6,998			\$955	\$7,953
33	PRO	PROFIT			10%	\$4,865			\$664	\$5,529
34	CONT	CONTINGENCY			20%	\$10,703			\$1,461	\$12,164
35		TOTAL COST				\$64,218			\$8,768	\$72,986

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7086 - Replace Existing SZ w/ VAV AHU w/Reheat

A. CONSTRUCTION COST	=	\$17,292
B. SIOH COST	(5.5% of 1A) =	\$951
C. DESIGN COST	(6.0% of 1A) =	\$1,037
D. TOTAL COST	(1A + 1B + 1C) =	\$19,280
E. SALVAGE VALUE OF EXISTING EQUIPMENT =		\$0
F. PUBLIC UTILITY COMPANY REBATE =		\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$19,280

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS: JAN '95

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	92	\$1,108	15.88	\$17,591
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	122	\$504	18.30	\$9,223
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$183	14.88	\$2,719
F. TOTAL		214	\$1,794		-----> \$29,533

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1 ANNUAL MAINTENANCE	\$0	14.88	\$0
2	\$0	14.88	\$0
3	\$0	14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST (-)	\$0		\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$12,554	5	0.863	\$10,834
b.				\$0
c.				\$0
d. TOTAL	\$12,554			\$10,834

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bd4) = \$10,834

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-)	(2F3 + 3A4 + (3Bd1/Economic Life))	\$2,422
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY)	(1G/4) =	7.96
6. TOTAL NET DISCOUNTED SAVINGS	(2F5 + 3C) =	\$40,367
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR)	(6/1G) =	2.09

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7086								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4		NEW SYSTEMS INSTALLATION								
5	AHU5400	5,400 CFM AHU, COOLING ONLY	EA.	1.0	\$3,803.33	\$3,803	Q-6	30	\$603	\$4,406
6	VSD3	VARIABLE SPEED DRIVE W/ CONTRLER, 3HP	EA.	1.0	\$2,238.39	\$2,238	1-ELEC	10.5	\$220	\$2,458
7	VAVBX35	VAV BOX, 3500 CFM, ELEC	EA.	2.0	\$310.08	\$620	1-SHEE	1.48	\$62	\$682
8	REHEAT3	REHEAT COIL, 2ROW, 3x1'	EA.	2.0	\$154.07	\$308	Q-5	1.32	\$51	\$359
9	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82
10	WIRE#12	COPPER WIRING #12	C.L.F.	3.0	\$7.41	\$22	1-ELEC	0.727	\$46	\$68
11	STLPIP1	STEEL PIPE SCH. 40, 1" W/HANGERS	L.F.	100.0	\$2.10	\$210	Q-1	0.151	\$293	\$503
12		FITTINGS, 5%				\$11			\$15	\$25
13	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20	\$402
14	INSLPIP1	1" FIBERGLASS PIPE INSULATION, 1" THCK	L.F.	100.0	\$0.62	\$62	Q-14	0.073	\$134	\$196
15	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	500.0	\$0.47	\$233	Q-10	0.094	\$913	\$1,146
16	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	300.0	\$0.83	\$250	Q-14	0.053	\$293	\$543
17										
18										
19										
20										
21										
22										
23		EXISTING SYSTEM DEMOLITION								
24		AHU DEMOLITION	TON	1.0			Q-5	17.778	\$345	\$345
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$8,188			\$3,028	\$11,216
32	OH	OVERHEAD			17%	\$1,376			\$509	\$1,884
33	PRO	PROFIT			10%	\$956			\$354	\$1,310
34	CONT	CONTINGENCY			20%	\$2,104			\$778	\$2,882
35	TOTAL COST					\$12,624			\$4,668	\$17,292

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade			SHEET 1 OF 1		DATE PREPARED 22-May-95		
ENGINEER		E M C Engineers, Inc. Denver, CO			ESTIMATOR C. Wohler		CHECKED BY A. Niemeyer		
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST		LABOR COST			TOTAL
				Quantity	Unit Cost	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7086							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	\$0

SHEET 1 OF 1

DATE PREPARED	22-May-95
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ESTIMATOR	C. Wohler
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CHECKED BY	A. Niemever
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Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7086								
2		NON-RECURRING								
3		NEW SYSTEMS INSTALLATION								
4										
5	AHUH5400	5,400 CFM AHU	EA.	1.0	\$4,563.99	\$4,564	Q-6	31.5	\$633	\$5,197
6	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24	1-ELEC	0.8	\$17	\$41
7	WIRE#12	COPPER WIRING #12	C.L.F.	1.5	\$7.41	\$11	1-ELEC	0.727	\$23	\$34
8	STLPIP1	STEEL PIPE SCH. 40, 1" W/HANGERS	L.F.	60.0	\$2.10	\$126	Q-1	0.151	\$176	\$302
9		FITTINGS, 5%				\$6			\$9	\$15
10	CNTV1	CONTROL VALVE 1"	EA.	2.0	\$190.89	\$382	1-PLUM	0.471	\$20	\$402
11	INSLPIP1	1" FIBERGLASS PIPE INSULATION, 1" THCK	L.F.	60.0	\$0.62	\$37	Q-14	0.073	\$81	\$118
12	DUCT1000	GAL. STEEL DUCTWORK, 500 TO 1000 LB.	LB.	500.0	\$0.47	\$233	Q-10	0.094	\$913	\$1,146
13	DTINSL2"	DUCT INSULATION, 2" THICK	S.F.	300.0	\$0.83	\$250	Q-14	0.053	\$293	\$543
14										
15										
16										
17										
18										
19										
20										
21										
22		EXISTING SYSTEM DEMOLITION								
23		AHU DEMOLITION	TON	1.0			Q-5	17.778	\$345	\$345
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$5,633			\$2,509	\$8,142
32	OH	OVERHEAD			17%	\$946			\$422	\$1,368
33	PRO	PROFIT			10%	\$658			\$293	\$951
34	CONT	CONTINGENCY			20%	\$1,448			\$645	\$2,092
35	TOTAL COST		-	-	-	\$8,685	-	-	\$3,868	\$12,554

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:
				C. Wohler

1. INVESTMENT: BLDG 7178 - Replace 3 Window ACs w/ 1SZ AHU

A.	CONSTRUCTION COST	=	\$11,220
B.	SIOH COST	(5.5% of 1A) =	\$617
C.	DESIGN COST	(6.0% of 1A) =	\$673
D.	TOTAL COST	(1A + 1B + 1C) =	\$12,511
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F.	PUBLIC UTILITY COMPANY REBATE	=	\$0
G.	TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$12,511

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	52	\$628	15.88	\$9,967
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	0	\$0	18.30	\$0
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$826	14.88	\$12,293
F. TOTAL		52	\$1,454		-----> \$22,259

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

1	ANNUAL MAINTENANCE	(\$141)	14.88	(\$2,094)
2		\$0	14.88	\$0
3		\$0	14.88	\$0
4	TOTAL ANNUAL DISC. SAVINGS (+) / COST	(\$141)		(\$2,094)

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$4,071	5	0.863	\$3,513
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$4,071			\$3,513

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$1,419

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$1,517

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 8.25

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$23,679

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 1.89

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST	SHEET	1	OF	1
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PROJECT	Fort Riley Feasibility Study for HVAC Upgrade	DATE PREPARED	22-May-95
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ENGINEER	E M C Engineers, Inc.	ESTIMATOR	C. Wohler
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Denver, CO

CHECKED BY A. Niemeyer

SHEET 1 OF 1

DATE PREPARED	22-May-95
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ESTIMADOR	C. Wohler
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CHECKED BY	A. Niemever
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Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7178								
2		PROPOSED SYSTEM MODIFICATIONS								
3										
4		NEW SYSTEMS INSTALLATION								
5	AHUH1300	1,300 CFM AHU	EA.	1.0	\$2,296.53	\$2,297	Q-5	13.9965	\$271	\$2,568
6	12X6SA	12X6 SA GRILLES	EA.	6.0	\$9.84	\$59	1-SHEE	0.348	\$43	\$102
7	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	132.0	\$0.47	\$61	Q-10	0.098	\$251	\$313
8	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	1.0	\$24.23	\$24	1-ELEC	0.8	\$17	\$41
9	WIRE#12	COPPER WIRING #12	C.L.F.	0.5	\$7.41	\$4	1-ELEC	0.727	\$8	\$11
10	ACCU7.5	7.5 TON ACCU	EA.	1.0	\$3,125.03	\$3,125	Q-5	29.091	\$564	\$3,689
11	CUIPI2	COPPER PIPE TYPE L, 2" W/HANGERS	L.F.	15.0	\$5.96	\$89	1-PLUM	0.19	\$61	\$151
12		VALVES AND FITTINGS ADD 15%				\$13			\$9	\$23
13	CUIPI0.75	COPPER PIPE TYPE L, 0.75" W/HANGERS	L.F.	15.0	\$1.84	\$28	1-PLUM	0.105	\$34	\$62
14		VALVES AND FITTINGS ADD 15%				\$4			\$5	\$9
15	WIRE#6	COPPER WIRING #6	C.L.F.	1.0	\$24.71	\$25	1-ELEC	1.231	\$26	\$50
16										
17										
18										
19										
20										
21										
22										
23										
24										
25		EXISTING SYSTEMS DEMOLITION								
26		WAC REMOVAL	TON	0.8			Q-5	17.778	\$259	\$259
27										
28										
29										
30										
31		SUBTOTAL				\$5,729			\$1,549	\$7,278
32	OH	OVERHEAD			17%	\$962			\$260	\$1,223
33	PRO	PROFIT			10%	\$669			\$181	\$850
34	CONT	CONTINGENCY			20%	\$1,472			\$398	\$1,870
35	TOTAL COST			-	-	\$8,833	-	-	\$2,387	\$11,220

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade				SHEET 1 OF 1		DATE PREPARED 22-May-95	
ENGINEER		E M C Engineers, Inc. Denver, CO				ESTIMATOR C. Wohler		CHECKED BY A. Niemeyer	
Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST		
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7178	BLDG 7178						
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4	MNT-FC	MAINT. ON FCs - INSPEC. / YR	EA.	3.0	\$0.00	\$0	Q-6	4	\$241
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$241
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17		MAINT. ON AHU - INSPEC. / YR <= 5000 CFM	EA.	1.0			Q-6	19	\$382
18	MNT-AHU1								
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$382
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	(\$141)

ENGINEER'S OPINION OF PROBABLE COST

PROJECT Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER E M C Engineers, Inc.
Denver, CO

SHEET 1 OF 1
DATE PREPARED 22-May-95
ESTIMATOR C. Wohler
CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7178								
2		NON-RECURRING								
3										
4										
5	WAC1.5	EXISTING SYSTEM REPLACEMENT WINDOW AIR CONDITIONER, 1.5 TON	EA.	3.0	\$750.98	\$2,253	L-2	2.667	\$129	\$2,382
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21		EXISTING SYSTEMS DEMOLITION	TON	0.8			Q-5	17.778	\$259	\$259
22		WAC REMOVAL								
23										
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$2,253			\$388	\$2,641
32	OH	OVERHEAD			17%	\$378			\$65	\$444
33	PRO	PROFIT			10%	\$263			\$45	\$308
34	CONT	CONTINGENCY			20%	\$579			\$100	\$679
35	TOTAL COST					\$3,473			\$598	\$4,071

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	Fort Riley	REGION: 2 (Kansas)	PROJECT NO:	1406-005	
PROJECT TITLE:	Feasibility Study for HVAC Upgrade		FISCAL YEAR:	1995	
ANALYSIS DATE:	05/22/95	ECONOMIC LIFE:	20	PREPARED BY:	C. Wohler

1. INVESTMENT: BLDG 7806 - Replace SZs AHUs w/ VAV AHUs

A. CONSTRUCTION COST	=		\$31,366
B. SIOH COST	(5.5% of 1A) =		\$1,725
C. DESIGN COST	(6.0% of 1A) =		\$1,882
D. TOTAL COST	(1A + 1B + 1C) =		\$34,973
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=		\$0
F. PUBLIC UTILITY COMPANY REBATE	=		\$0
G. TOTAL INVESTMENT	(1D - 1E - 1F) =		-----> \$34,973

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR 85-3273-9 USED FOR DISCOUNT FACTORS:

JAN '95

ENERGY SOURCE	FUEL COS \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT.	\$12.10	263	\$3,183	15.88	\$50,550
B. DIST	\$0.00	0	\$0	19.16	\$0
C. NAT GAS	\$4.12	(95)	(\$392)	18.30	(\$7,181)
D. COAL	\$0.00	0	\$0	16.62	\$0
E. ELEC. DEMAND			\$735	14.88	\$10,937
F. TOTAL		168	\$3,526		-----> \$54,306

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
1 ANNUAL MAINTENANCE	\$0		14.88	\$0
2	\$0		14.88	\$0
3	\$0		14.88	\$0
4 TOTAL ANNUAL DISC. SAVINGS (+) / COST	\$0			\$0

B. NON-RECURRING (+/-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS/COST (4)
a. BASELINE EQUIP. REPLCMNT.	\$23,323	5	0.863	\$20,128
b.				\$0
c.				\$0
d.				\$0
e.				\$0
f. TOTAL	\$23,323			\$20,128

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-) (3A4 + 3Bf4) = \$20,128

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2F3 + 3A4 + (3Bf1/Economic Life)) \$4,692

5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 7.45

6. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) = \$74,433

7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1G) = 2.13

(MUST HAVE SIR > 1.25 TO QUALIFY)

ENGINEER'S OPINION OF PROBABLE COST

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT		Fort Riley Feasibility Study for HVAC Upgrade							
ENGINEER		E M C Engineers, Inc.							
		Denver, CO							
		SHEET		1		OF		1	
		DATE PREPARED		22-May-95		ESTIMATOR		C. Wohler	
		CHECKED BY		A. Niemeyer					

ENGINEER'S OPINION OF PROBABLE COST									
PROJECT				SHEET 1 OF 1			DATE PREPARED 22-May-95		
ENGINEER				ESTIMATOR C. Wohliert			CHECKED BY A. Niemeyer		
				MATERIAL COST			LABOR COST		
Line No.	Item Refer Code	Item Description	Unit of Measure	Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total
1		BUILDING 7806							
2		ANNUAL RECURRING							
3		ANNUAL MAINTENANCE COST - BASELINE							
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
16		ANNUAL MAINTENANCE COST - NEW HVAC REPLACEMENT							
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29		TOTAL ANNUAL MAINTENANCE COST - BASELINE	-	-	-	\$0	-	-	\$0
30									
31									
32									
33									
34									
35		TOTAL ANNUAL MAINTENANCE COST SAVINGS	-	-	-	\$0	-	-	\$0

ENGINEER'S OPINION OF PROBABLE COST

PROJECT	Fort Riley Feasibility Study for HVAC Upgrade
ENGINEER	E M C Engineers, Inc. Denver, CO

SHEET 1 OF 1

DATE PREPARED 22-May-95

ESTIMATOR C. Wohler

CHECKED BY A. Niemeyer

Line No.	Item Refer Code	Item Description	Unit of Measure	MATERIAL COST			LABOR COST			TOTAL
				Quantity	Unit Cost	Total	Crew/ Worker	Hours/ Unit	Total	
1		BUILDING 7806								
2		NON-RECURRING								
3										
4		EXISTING SYSTEM REPLACEMENT								
5	AHUH5400	5,400 CFM AHU	EA.	1.0	\$4,563.99	\$4,564	Q-6	31.5	\$633	\$5,197
6	AHUH8000	8,000 CFM AHU	EA.	1.0	\$5,319.81	\$5,320	Q-6	42	\$844	\$6,164
7	DUCT500	GAL. STEEL DUCTWORK, 200 TO 500 LB.	LB.	300.0	\$0.47	\$140	Q-10	0.098	\$571	\$711
8	E-TSTAT1	SINGLE SETPOINT ELEC. TSTAT, 3 WIRE	EA.	2.0	\$24.23	\$48	1-ELEC	0.8	\$33	\$82
9	WIRE#12	COPPER WIRING #12	C.L.F.	0.8	\$7.41	\$6	1-ELEC	0.727	\$11	\$17
10	STLPIP1.5	STEEL PIPE SCH. 40, 1.5" W/HANGERS	L.F.	120.0	\$2.95	\$353	Q-1	0.2	\$465	\$819
11		FITTINGS ADD 5%				\$18			\$23	\$41
12	INSLPIP1.25	1.25" FIBERGLASS PIPE INSULATION, 1.5" THCK	L.F.	120.0	\$1.40	\$167	Q-14	0.08	\$177	\$344
13	CNTV1	CONTROL VALVE 1"	EA.	4.0	\$190.89	\$764	1-PLUM	0.471	\$41	\$804
14										
15										
16										
17										
18										
19										
20										
21										
22		EXISTING SYSTEMS DEMOLITION								
23		AHU DEMO	TON	2.8			Q-5	17.778	\$948	\$948
24										
25										
26										
27										
28										
29										
30										
31		SUBTOTAL				\$11,380			\$3,748	\$15,127
32	OH	OVERHEAD			17%	\$1,912			\$630	\$2,541
33	PRO	PROFIT			10%	\$1,329			\$438	\$1,767
34	CONT	CONTINGENCY			20%	\$2,924			\$963	\$3,887
35	TOTAL COST		-	-	-	\$17,544	-	-	\$5,778	\$23,322